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Front Cover: An excellent photograph of a ship sailing through steam fog or as sometimes called sea smoke. See an item concerning steam fog on page 217. U.S. Navy Photograph.

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Mariners Weather Log

Editor: Elwyn E. Wilson

October-November-December 1983
Volume 27, Number 4
Washington, D.C.

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The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 1,1985.

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Mariners Weather Log

1982 SAHARAN DUST OUTBREAK

Jane A. D'Aguanno
National Environmental Satellite, Data, and Information Service
Washington, D.C. 20233

Geostationary satellite systems provide excellent platforms for detecting, monitoring, and tracking atmospheric obscurations due to sand and dust. The Geostationary Operational Environmental Satellite (GOES) East recently recorded an outbreak of sand or dust from the western portion of the Sahara Desert. GOES East documented the beginning of the event on July 23, 1982, and monitored its subsequent dispersion across the Atlantic Ocean, the dust reaching Florida on July 30. The dust spread to a latitude of approximately 30°N, one of the more northerly extents on record.

GOES East, one of five geosynchronous meteorological satellites positioned around the Earth, is stationed over the equator at 75°W longitude. Altitude of the spacecraft is 35,000 km. These satellites provide repetitive coverage of the full Earth disc as frequently as every half hour. The primary instrument onboard is the visible and infrared (IR) spin-scan radiometer (VISSR). Visible and IR imagery are provided at various resolutions. IR images are limited to 8 km resolution. Visible data ranges from 4 km resolution for full Earth disc images, to a sector of the full disc with a 1 km resolution. A computer grid can be electronically overlaid on the images.

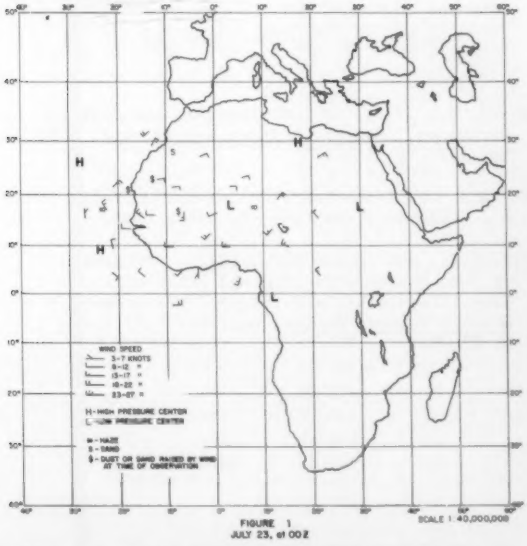

Figure 1.--Surface meteorological conditions on July 23 contributed to the Saharan dust outbreak. Weather observations stations indicate sand and haze conditions over the region.

Dust storms of this type occur periodically during Saharan summers. Documentation using satellite data had been done by Ernst (1974) and Lushine (1975) with the geostationary platform, and by Shenk and Curran (1974) through the Nimbus polar orbiter system. The cause of such storms is described by Carlson and Prospero (1972). These storms appear to be related to intense and prolonged surficial heating throughout the summer. When cyclonic and anticyclonic systems pass through the region, they commonly provide the impetus for suspending the dust particles and raising them into the atmosphere.

On July 23, a low pressure system centered over the western Sahara helped provide the conditions for such an event. Surface meteorological charts were used to confirm the presence of a dust storm (fig. 1). This chart shows conditions that contributed to the storm and indicates observations at weather stations. On the subsequent days, July 23 through 30, the dust was visible on the imagery as it traveled westward across the Atlantic. Figure 2 shows the initial outbreak of the dust from Africa, with the dashed line indicating the leading edge (the somewhat less bright background of the dust out to about 40°W is sun glint off the ocean). Travel time of the dust from Africa to Florida was about 7 days at an approximate speed of 40 km per hour, or about 960 km per day. By July 25 the leading edge of the dust had spread to about 50°W longitude; the pattern

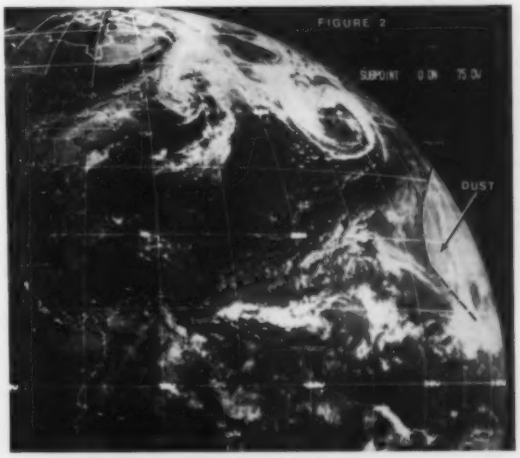

Figure 2.--GOES image of July 23 at 1201 GMT, shows initial outbreak of dust. Dashed boundary indicates leading edge of dust.

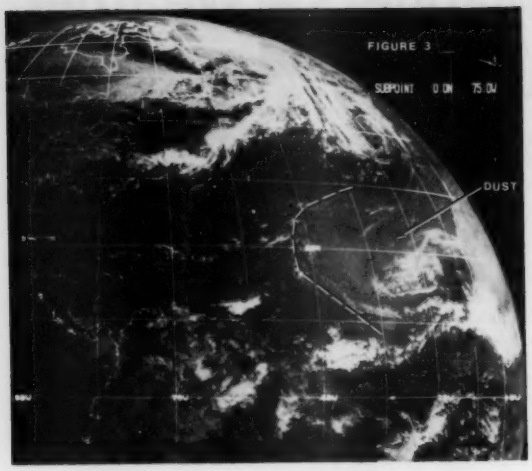

Figure 3.--July 25 (at 1201 GMT) the satellite image shows the leading edge of the dust storm crossing 50° longitude.

of dust is clearly evident in figure 3. Satellite data for July 28 indicated that the dust's leading edge had reached the Caribbean Sea in the vicinity of Puerto Rico, Haiti, and the Dominican Republic. Ground confirmation of the dust track was available through ship reports and surface meteorological charts.

The 2-km resolution sector image, showed the dust had reached Florida by July 30 (fig. 4). Measurements were taken by the Dade County Environmental Resources Management Office (Aspy, 1982), which recorded total solid particle levels at the Hialeah test site at 138 $\mu g/m^3$. Compared with the 1981 mean of all Dade County test sites of 67 $\mu g/m^3$, this event was more than twice as intense. Similar data were found at West Airport (132.9 $\mu g/m^3$). Mean values at these locations in 1981 were 70 and 61 $\mu g/m^3$, respectively.

The following day particle measurements returned to normal levels. The Dade County office also reported that ground-based operations recorded good visibility at the surface but hazy conditions existed above the testing height of 500 ft. This haze appears to have limited visibility to 5.8 - 6.7 km.

The GOES system provides timely data for monitoring large-scale global events such as this dust storm. Geostationary satellites available around the equator make it possible

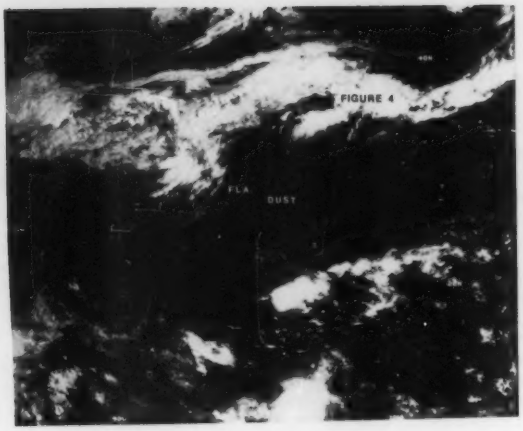

Figure 4.--By July 30, GOES 2 km visible image shows the dust over Florida, doubling the normal pollutant count.

to locate and study atmospheric obscurations of this nature.

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WESTERN NORTH PACIFIC TYPHOONS, 1982

Extracted from the Annual Tropical Cyclone Report, 1982, U.S. Naval Oceanographic Command Center, Joint Typhoon Warning Center, Guam, Mariana Islands.

The western North Pacific experienced the fourth consecutive year of below average tropical cyclone activity during 1982. Twenty-eight tropical cyclones occurred in 1982, three and one-half less than the annual average. Only two significant tropical cyclones failed to develop beyond the tropical depression (TD) stage and seven tropical storms (TS) failed to reach typhoon intensity. Of the 19 tropical cyclones that developed to typhoon (TY) intensity (the highest frequency since 1972), only two reached the 130 kn (67 m/sec) intensity necessary to be classified as supertyphoons (STY). In the western North Pacific, tropical cyclones reaching tropical storm intensity or greater are assigned names in alphabetical order from a list of alternating male/female names. Table 1 provides a summary of key statistics for western North Pacific tropical cyclones. Each tropical cyclone's maximum surface winds (in knots) and minimum observed sea level pressure (in millibars) were obtained from best estimates based on all available data. The distance traveled (in nautical miles) was calculated from the JTWC official best tracks.

Tables 2 through 4 provide further information on the monthly distribution of tropical cyclones and statistics on Tropical Cyclone Formation Alerts and Warnings.

The cyclone tracks are shown in figures 5

Table 1.--Tropical cyclones, western North Pacific, 1982

TROPICAL CYCLONE	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WIND (KT)	OBSERVED MSLP (MB)	BEST TRACK DISTANCE TRAVELED (NM)
01 TS MAMIE	16 MAR - 24 MAR	9	35	60	990	2733
02 TY NELSON	19 MAR - 1 APR	14	53	105	934	3063
03 TY ODESSA	29 MAR - 4 APR	7	25	75	964	1528
04 TY PAT	17 MAY - 23 MAY	7	24	105	947	1994
05 TY RUBY	21 JUN - 27 JUN	7	25	75	970	2173
06 TS TESS	29 JUN - 2 JUL	4	14	35	999	585
07 TS SKIP	30 JUN - 1 JUL	2	8	50	991	1197
08 TS VAL	3 JUL - 4 JUL	2	7	55	987	867
09 TS WINONA	12 JUL - 17 JUL	6	22	55	985	1486
10 TY ANDY	22 JUL - 30 JUL	9	32	120	920	2072
11 STY BESS	22 JUL - 2 AUG	12	43	140	901	2811
12 TY CECIL	5 AUG - 14 AUG	10	39	125	914	1665
13 TY DOT	9 AUG - 15 AUG	7	27	80	960	2435
14 TY ELLIS	18 AUG - 27 AUG	10	36	125	913	2640
15 TY FAYE	21 AUG - 3 SEP	14	50	90	960	2454
16 TY GORDON	27 AUG - 5 SEP	10	38	100	944	2014
17 TS HOPE	4 SEP - 6 SEP	3	10	60	979	630
18 TY IRVING	5 SEP - 16 SEP	12	44	90	952	1778
19 TY JUDY	5 SEP - 12 SEP	8	29	90	953	2133
20 TY KEN	16 SEP - 25 SEP	10	37	110	936	1647
21 TS LOLA	16 SEP - 19 SEP	4	12	50	993	1424
22 TD 22	21 SEP - 22 SEP	2	5	30	1001	282
23 STY MAC	1 OCT - 9 OCT	9	32	140	895	2287
24 TY NANCY	11 OCT - 18 OCT	8	29	115	926	2400
25 TD 25	15 OCT - 16 OCT	2	5	20	1002	228
26 TY OWEN	15 OCT - 27 OCT***	12	40	105	939	3604
27 TY PAMELA	24 NOV - 9 DEC	16	60	100	940	4291
28 TY ROGER	8 DEC - 10 DEC	3	12	65	985	906
1982 TOTALS:		150*	793**			

* OVERLAPPING DAYS INCLUDED ONLY ONCE IN SUM
** IN ADDITION, 17 AMENDED WARNINGS WERE ISSUED DURING 1982
*** NO WARNINGS WERE ISSUED FOR TY OWEN ON 23 OCTOBER

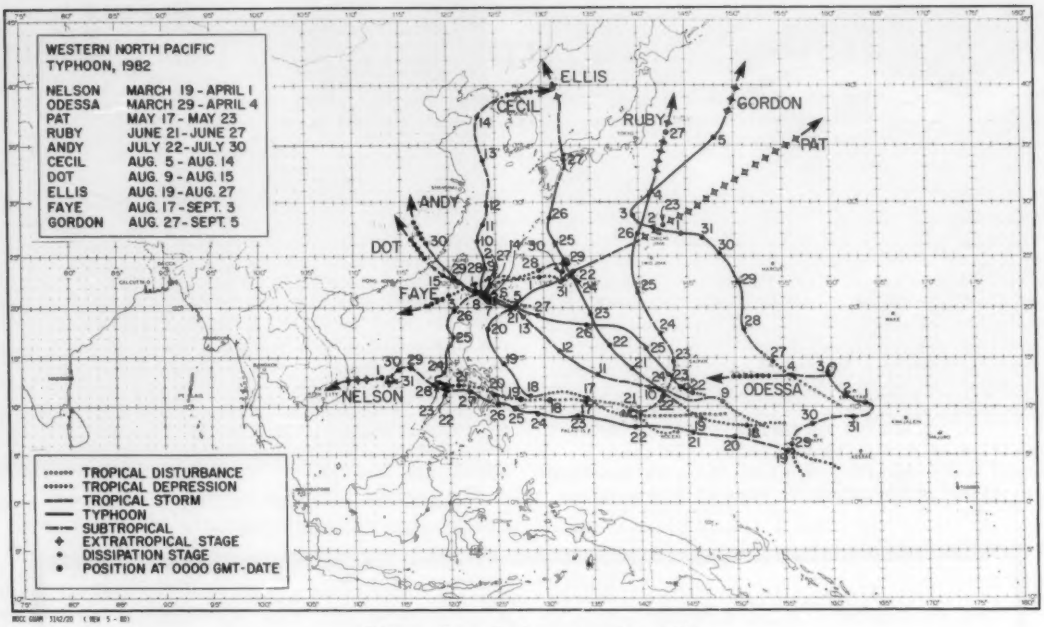


Figure 5.-- Typhoon tracks, 1982

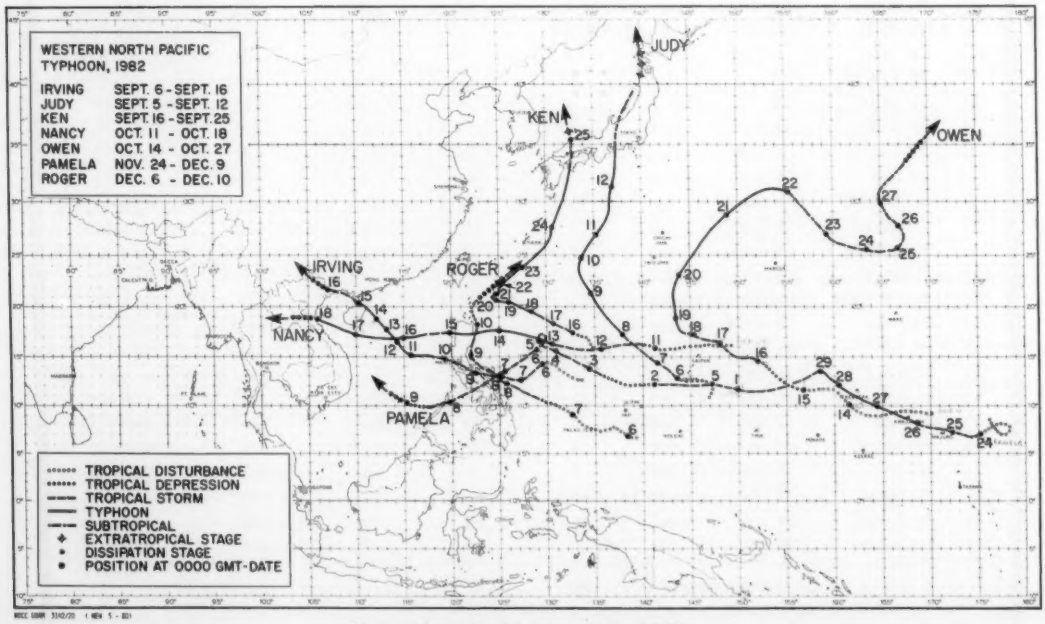


Figure 6.-- Typhoon tracks, 1982

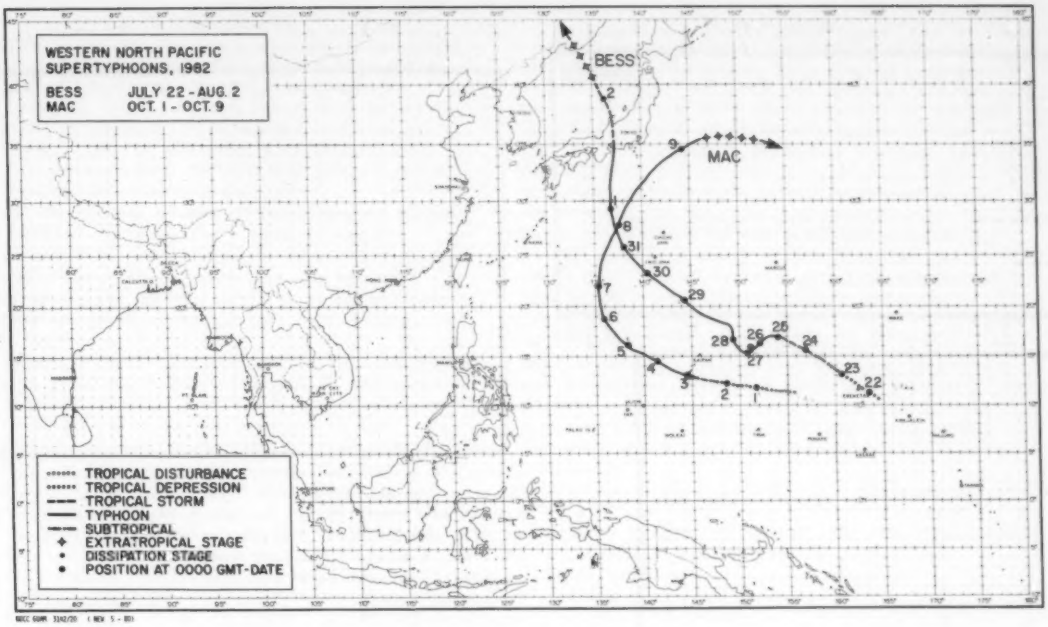


Figure 7.-- Supertyphoon tracks, 1982

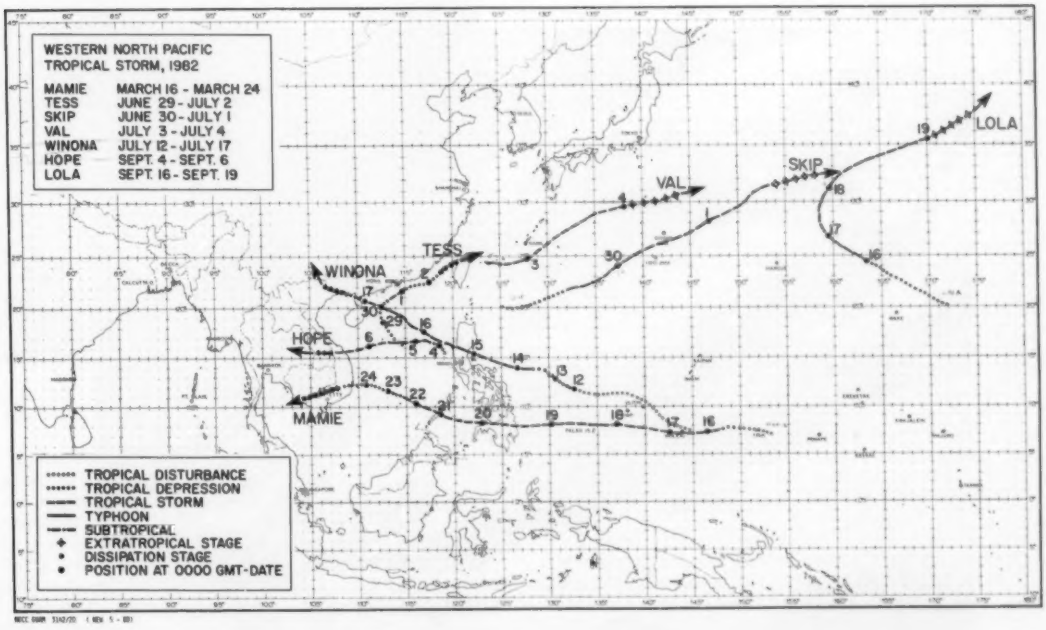


Figure 8.-- Tropical storm tracks, 1982

Table 2.-- 1982 significant tropical cyclones

WESTERN NORTH PACIFIC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	(1959-1981) AVERAGE	CASES
TROPICAL DEPRESSIONS	0	0	0	0	0	0	0	0	1	1	0	0	2	4.0	91
TROPICAL STORMS	0	0	1	0	0	2	2	9	2	0	0	0	7	9.8	225
TYPHOONS	0	0	2	0	1	1	2	5	3	3	1	1	19	17.9	409
ALL TROPICAL CYCLONES	0	0	3	0	1	3	4	5	6	4	1	1	28	31.5	725
1959-1981 AVERAGE	.6	.3	.7	1.0	1.4	2.0	5.0	6.3	5.9	4.4	2.7	1.4	31.5	PREVIOUS 23-YEAR	
CASES	13	8	15	22	32	45	115	144	136	101	62	32	725	HISTORY	

FORMATION ALERTS: 26 of 26 Formation Alert Events developed into significant tropical cyclones. Tropical Cyclone Formation Alerts were issued for all but two of the significant tropical cyclones that developed during 1982.

WARNINGS:
Number of warning days: 158
Number of warning days with two tropical cyclones in region: 56
Number of warning days with three or more tropical cyclones in region: 6

Table 3.-- Frequency of typhoons by month and year

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(1945-1958) AVERAGE	.6	.1	.3	.6	.7	1.1	2.0	2.9	3.2	2.4	2.0	.9	16.3
1959	0	0	0	1	0	0	1	5	2	3	2	2	17
1960	0	0	0	1	0	2	2	0	0	4	1	1	11
1961	0	0	1	0	2	1	3	3	5	2	1	1	20
1962	0	0	0	1	2	0	5	7	2	4	3	0	24
1963	0	0	0	1	1	2	1	3	3	4	0	2	19
1964	0	0	0	0	2	2	4	3	5	3	4	1	24
1965	1	0	0	1	2	2	4	3	5	2	1	0	21
1966	0	0	0	1	2	1	3	6	4	2	0	1	20
1967	0	0	1	1	0	1	3	4	4	3	3	0	20
1968	0	0	0	1	1	1	1	4	3	5	4	0	20
1969	1	0	0	1	0	0	2	3	3	3	1	0	13
1970	0	1	0	0	0	1	0	4	2	3	1	0	12
1971	0	0	0	3	1	2	4	3	5	3	1	0	24
1972	1	0	0	0	1	1	4	4	3	4	2	2	27
1973	0	0	0	0	0	0	4	3	2	4	0	0	13
1974	0	0	0	0	1	2	1	3	3	4	2	0	16
1975	1	0	0	0	0	0	1	3	4	3	2	0	15
1976	1	0	0	1	2	2	2	1	4	1	1	0	15
1977	0	0	0	0	0	0	3	0	2	3	2	1	11
1978	0	0	0	1	0	0	3	2	4	3	2	0	15
1979	1	0	1	1	0	0	2	2	3	2	1	1	14
1980	0	0	0	0	2	0	3	2	5	2	1	0	15
1981	0	0	1	0	0	2	0	2	4	1	2	2	14
1982	0	0	2	0	1	1	2	5	3	3	1	1	19
(1959-1982) AVERAGE	.3	.04	.3	.6	.9	1.0	2.9	3.4	3.3	3.0	1.6	.7	17.6
CASES	6	1	6	15	20	23	66	81	80	72	38	15	423

Table 4.-- Frequency of tropical storms and typhoons by month and year

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
(1945-1958) AVERAGE	.6	.1	.4	.5	.8	1.3	3.0	3.9	4.1	3.3	2.7	1.1	21.6
1959	0	1	1	1	0	0	3	6	6	4	2	2	26
1960	0	0	0	1	1	3	3	10	3	4	1	1	27
1961	1	1	1	1	3	2	5	4	6	5	1	1	31
1962	0	1	0	1	2	0	6	7	3	5	3	2	30
1963	0	0	0	1	1	3	4	3	5	5	0	3	25
1964	0	0	0	0	2	2	7	9	7	6	6	1	40
1965	2	2	1	1	2	3	5	6	7	2	2	1	34
1966	0	0	0	1	2	1	5	8	7	3	2	1	30
1967	1	0	2	1	1	1	6	8	7	4	3	1	35
1968	0	0	0	1	1	1	3	8	3	6	4	0	27
1969	1	0	1	1	0	0	3	4	3	3	2	1	19
1970	0	1	0	0	0	2	2	6	4	5	4	0	24
1971	1	0	1	3	4	2	8	4	6	4	2	0	35
1972	1	0	0	0	1	3	6	5	4	5	2	3	30
1973	0	0	0	0	0	0	7	5	2	4	3	0	21
1974	1	0	1	1	1	4	4	5	5	4	4	2	32
1975	1	0	0	0	0	0	2	4	5	5	3	0	20
1976	1	1	0	2	2	2	4	4	5	1	1	2	25
1977	0	0	1	0	0	1	4	1	5	4	2	1	19
1978	1	0	0	1	0	3	4	7	5	4	3	0	28
1979	1	0	1	1	1	0	4	2	7	3	2	2	24
1980	0	0	0	1	4	1	4	2	6	4	1	1	24
1981	0	0	1	2	0	2	5	7	4	2	3	2	28
1982	0	0	3	0	1	3	4	5	5	3	1	1	26
(1959-1982) AVERAGE	.5	.3	.6	.9	1.2	1.6	4.5	5.4	5.0	4.0	2.4	1.2	27.5
CASES	12	7	14	21	29	39	108	130	120	95	57	28	660

through 8 from first detection until dissipation or becoming extratropical. In tables 3 and 4 the storms are credited to the month that the first warning was issued. Maximum winds are estimates of 1-min average sustained speeds.

Individual typhoons are described in the following narratives. Times are GMT unless otherwise indicated. Tropical storm summaries may be found in Hurricane Alley of the appropriate issue of the Mariners Weather Log.

Figure 9.-- A spacecraft view of a tropical cyclone. Annual Tropical Cyclone Report, 1982.

TYPHOON NELSON

Typhoon Nelson was the second of three early season tropical cyclones in the western North Pacific which formed at very low latitudes southeast of Guam. Nelson was a well-behaved tropical cyclone which developed and tracked westward, south of a strong mid-tropospheric ridge (centered near 15°N, 150°E and extending west-northwest toward Taiwan).

In the initial stages of development, Nelson intensified rapidly from a weak tropical disturbance to a full-fledged tropical storm. At 0615, March 19 a reconnaissance aircraft reported flight level (1500 ft) winds of 66 kn, surface winds of 50 kn, and an extrapolated sea level pressure of 993 mb.

Nelson's rapid development was in response to a very strong divergence field in the upper-troposphere located over the cyclone, where a 40 to 60 kn easterly jet branched to the northwest and southwest. While these strong easterlies remained near Nelson, further development was limited to minimal typhoon strength. During this entire period, Nelson moved rapidly westward at speeds reaching 18 kn on April 22, after which a gradual slowing in forward speeds and further intensification followed. After maintaining intensities between 60 and 70 kn for 60 hr, a change in the upper air patterns allowed Nelson to deepen rapidly, reaching 100 kn within 24 hr.

Figure 10.-- Nelson displays a clear eye over Mindanao. NOAA 7.

On the 23d (fig. 10) nearby westerlies aloft provided a strong outflow channel to the north and northeast and an upper-level anticyclone was established. Nelson responded and reached a maximum intensity of 105 kn at 25/1200.

On March 27, a much weakened tropical storm Nelson entered the South China Sea after navigating through the south-central Philippines. Nelson briefly reintensified on March 28, before weakening under the influence of vertical wind shear. The final warning was issued for Nelson on April 1 while approximately 240 mi east of Nha Trang, Vietnam.

TYPHOON ODESSA

March is normally a relatively quiet month in the tropical western North Pacific, producing on the average less than one tropical cyclone per year. March 1982 was quite the contrary, with the genesis of three tropical cyclones taking place within a period of 13 days; 1967 was the most recent year with more than one tropical cyclone during March. Typhoon Odessa represents only the sixth typhoon to occur in March since the JTWC was established in 1959.

Just as March was a unique month in the level of tropical cyclone activity, Odessa was unique among the three tropical cyclones. Tropical cyclones which develop near 160°E tend to follow one of two climatological tracks: 60 percent move in a generally westward direction and 40 percent move in a generally northward direction. Odessa's track defied climatology as it moved both eastward and westward across the area where tropical cyclones normally move northward.

Typhoon Odessa was initially detected near 2°N, 159°E on March 26. Aircraft data and satellite imagery indicated that the circulation had rapidly organized and, at 29/0741 the initial warning was issued for Odessa.

Odessa's initial movement was to the northwest in response to a weakening of the subtropical ridge northeast of Guam and rapid cyclogenesis which was occurring southeast of Japan. A major high pressure system moved southeastward from Japan and strengthened the low-level northeasterly winds regime west of Odessa and created an effective block to any continued northwestward advance.

On March 30 and 31, Odessa tracked eastward at 10 to 11 kn. Odessa began to slow and eventually turn toward the north. As Odessa approached 10°N, it turned west-northwestward. Odessa had maintained an intensity near 50 kn as westerlies restricted the development of the cyclone's circulation. Odessa developed a closed circulation in the mid-tropospheric levels and a noticeable intensification trend began which culminated with a peak intensity of 75 kn by April 3.

On April 3, Odessa was approaching a break in the subtropical ridge, along 158°E. Strong mid- and upper-level southerly winds moved over Odessa and a rapid shearing of the major convective features to the northeast followed. At 03/0800, a reconnaissance aircraft located Odessa's low-level circulation center 90 mi southwest of the closest convective activity. Odessa weakened rapidly and was no longer detectable from satellite imagery after 04/0600.

TYPHOON PAT

The transition from the winter to the summer monsoon regime over the tropical western North Pacific can vary greatly from year to year. During this transition time (March through May), tropical cyclone activity can be very strong (six in 1980) or moderate (three in 1981). In May, 1982, there were several disturbances that developed in the near-equatorial

trough and then dissipated without producing a significant tropical cyclone. During the third week of May, typhoon Pat developed and became the only disturbance to reach warning status in the region between early April and late June.

The disturbance that eventually produced Typhoon Pat was first detected as a mid-level circulation southwest of Guam on May 14. Aircraft reconnaissance at 14/0600 reported no evidence of a surface circulation but did observe an area of strong low-level convergence near the convective disturbance.

The first warning on Pat, as tropical depression 04, was issued on the 17th when sustained increased convective organization was observed on satellite imagery.

Pat tracked westward until the 18th. Then abruptly at 0600, Pat turned northward and paralleled the eastern portion of the Philippines for 2 days.

Shortly after turning northward, Pat began to rapidly intensify, aided by a 200-mb wind maximum that had moved north of Pat and had enhanced outflow channels to the northeast. At 21/1200, Typhoon Pat reached its maximum intensity of 105 kn (fig.11). This rapid intensification was not anticipated as Pat was forecast to only attain minimal typhoon strength. Fortunately, Pat's increased intensity did not bring any destructive winds to the Philippines, previously hit by tropical storm Mamie and typhoon Nelson.

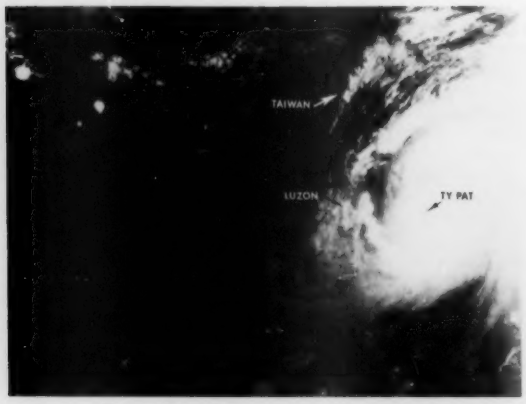


Figure 11.-- Typhoon Pat near maximum intensity of 105 kn 150 mi east of Luzon on May 20. NOAA 7 Visual Image.

As Typhoon Pat approached 20°N, a track toward the northeast became increasingly favorable. In recurvature, Pat began to accelerate in response to increasing mid- and upper-level westerly steering currents. A new method for forecasting the acceleration of northward-moving tropical cyclones, developed by JTWC personnel during the past year, was used to predict the point of initial acceleration as well as the rate of acceleration; Typhoon Acceleration Prediction Technique (TAPT) (Weir, 1982), utilizes 200 mb analysis data to determine possible future acceleration.

On May 22, as Typhoon Pat approached 24°N, a weak frontal system (associated with an extratropical low east of Japan) was moving toward Pat and the first indications of Pat's eventual transition to an extra-tropical LOW were observed. Since 21/1600, there had been a marked decrease in Pat's deep-layer convection; additionally, aircraft reconnaissance data indicated that the central sea level pressure had risen to 988 mb. Although observed winds were still near typhoon strength, the maximum winds were observed at distances much further from the center than in previous missions. These expanding wind radii are frequently associated with tropical cyclones undergoing extratropical transition as the cyclone's energy source changes from latent heat release to a more baroclinic process. By 22/1200, synoptic data gave evidence of the incursion of cool, dry air into Pat's center and satellite imagery showed the system merging into a weak frontal boundary.

TYPHOON RUBY

Typhoon Ruby developed from a convective disturbance which was initially detected southeast of Guam on June 18. During the first ten days of Ruby's development, its track and eventual extratropical transition were dramatically affected by several events which can be traced to fairly rapid changes in the upper-troposphere.

This disturbance tracked westward to near 145°E where it weakened significantly. On June 20, a cloud cluster developed near 9°N, 141°E and continued moving westward south of Ulithi Atoll. Ulithi's 20/0600 surface observation which reported a 6-hour pressure fall of 5 mb to 1004 mb, and a windshift from 030° at 20 kn to 100° at 25 kn.

During the next 42 hr, satellite imagery and synoptic data indicated very little westward movement, with the system moving erratically between Yap and Ulithi. The first aircraft reconnaissance into the system late on the 20th located a well-defined, very compact, 995-mb circulation center 45 mi west-southwest of Ulithi. The first warning was issued for tropical storm Ruby at 0000 on the 21st with a forecast track toward the west-northwest. At 21/0830, an aircraft fix located Ruby 35 mi south of Ulithi; this fix was in good agreement with Ulithi's 21/0600 observation which would be the last received from Ulithi for 24 hr. During the next 18 hr, fix positions from infrared satellite imagery showed Ruby moving northward, then northwestward, passing over Ulithi.

Ruby turned northeastward toward Guam on the 22d, its intensity near 35 kn. During this period, much of Ruby's circulation pattern was involved with monsoonal flow. Not until June 23, when Ruby turned northward did its surface pressures fall and intensity increase.

As Ruby moved north-northwestward, the potential for recurvature, significant acceleration and extratropical transition became increasingly important. On the 26th Ruby had assumed a north-northeastward track and accelerated to 23 kn.

Ruby quickly transitioned to an extratropical LOW on the 26th. Ruby continued to move toward the north and rapidly occluded, becoming nearly stationary east of Hokkaido for several days thereafter.

TYPHOON ANDY

Andy formed on the northern edge of a zone of maximum cloudiness associated with the monsoon trough south of Guam on July 22. The cloudiness consolidated into three distinct masses centered near 132°E, 148°E and 168°E. The cloud centers near 148°E and 168°E drifted westward, intensified, and became typhoon Andy and supertyphoon Bess respectively.

Aircraft reconnaissance on the 22d located a small, tight circulation center with a minimum sea-level pressure of 995 mb. These data, along with observed winds of 35 to 40 kn prompted the issuance of the first warning. Although intensification was evident from July 20 to 24 on satellite imagery, the cloud pattern remained poorly defined and the circulation center was difficult to position -- except for a brief period on July 23, when the low-level center was visible on the satellite imagery. Aircraft reconnaissance was an invaluable asset during this period; no other reconnaissance platform was capable of following the low-level wind center, particularly since there was considerable interest on Guam as the fix data received

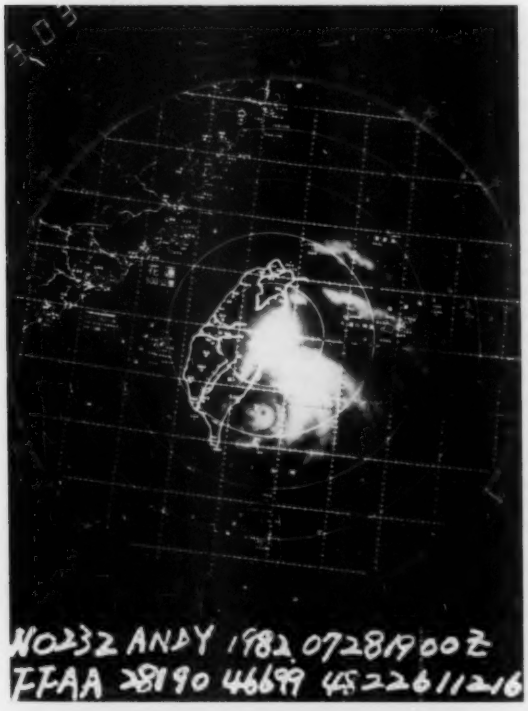


Figure 12.-- Typhoon Andy as seen by radar from Hua Lien at 1900 July 28. Photo courtesy of Central Weather Bureau, Taipei, Taiwan/

implied an anticyclonic loop 35 mi in diameter just 90 mi south of the island.

After completing the loop, Andy accelerated to the northwest and intensified. In Andy's wake, Guam experienced phenomenal surf on exposed southern and western beaches as a strong southwesterly fetch was brought to bear on the island on July 24. Andy's northwestward track turned abruptly toward the west as the cyclone reached 18°N on July 25.

At 1800 on July 2, Andy reached a maximum intensity of 120 kn. Until making landfall upon the southern portion of Taiwan on July 29 (fig. 12), Andy's intensity remained over 100 kn. Taiwan experienced torrential rains from the typhoon's passage; especially hard hit was the eastern coastal area, where considerable damage from flooding was reported. Weakened from Taiwan's rugged terrain, Andy continued westward, across the Formosa Strait, and dissipated in the mountainous area of southeastern China on July 30.

SUPERTYPHOON BESS

Bess formed at the eastern end of a maximum cloud zone associated with the monsoon trough anchored south of Guam. By July 21, this area of cloudiness had separated into three masses near 132°E, 148°E, and 168°E. The two easternmost cloud masses continued to develop and became typhoon Andy (10) and supertyphoon Bess. The third area dissipated over the Philippine Islands.

The first warning, with maximum winds of 30 kn, was issued on the 22d when the curvature of loosely organized cloud bands into the central cloud mass increased. Reconnaissance missions on the 22d and 23d indicated the surface and 700 mb centers were not alined vertically. Once this feature was eliminated, Bess began to intensify and by 24/1800, she was upgraded to typhoon strength based upon satellite imagery which indicated a 30 mi eye had developed.

Bess maintained her northwestward track for the first 48 hr in warning status. By 24/1800 a noticeable decrease in the speed of movement was observed as Bess began to move toward the west-northwest. Contrary to JTWC expectations, Bess continued to turn toward the southwest by 25/1200. During this period, Bess slowed to 5 kn and completed a 20 mi diameter cyclonic loop, while its intensity remained at 95 kn. Bess remained on its southwestward track until another short wave trough moved eastward from Japan on July 27. In response to this trough, Bess took a noticeable turn toward the north-northwest until 28/0600 when Bess began moving toward the northwest. While moving northwestward, a rapid intensification period began, culminating in the attainment of supertyphoon strength and a peak intensity of 140 kn at 0600 on July 29 (fig. 13).

As Bess approached 25°N, a decrease in forward movement was observed. Bess turned to a northward track. The Typhoon Acceleration Prediction Technique was employed, and correctly forecast significant acceleration commencing near 28°N. From this latitude, Bess did begin to accelerate toward the north and eventually

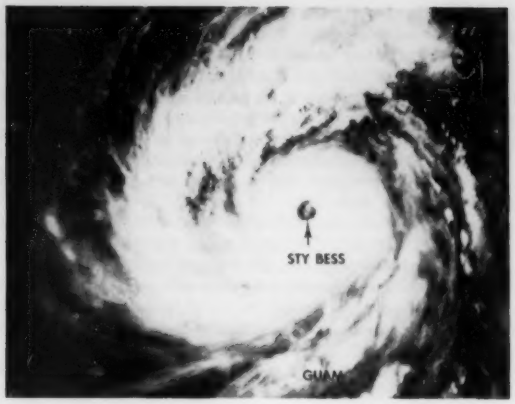


Figure 13.-- Supertyphoon Bess at maximum intensity at 0430 July 29 near 21°N, 144°E. NOAA 7 Visual Image.

merged with a low pressure center in the Sea of Japan on August 2.

Bess passed over the Araumi Peninsula on central Honshu where extensive damage and human suffering were reported. The greatest damage was caused by torrential rainfall which set off 1,557 landslides and flooded over 27,000 homes, leaving 25,000 persons homeless, and 59 dead. More than 25 ships ran aground or were lost, over 100 bridges were washed out, and nearly 300 acres of farmland were flooded.

TYPHOON CECIL

Typhoon Cecil was first distinguishable as a low-level circulation about 250 mi north of Truk on July 31. This disturbance persisted as a closed circulation on the surface streamline analyses and as an area of enhanced convective activity on satellite imagery that travelled westward along the monsoon trough for the next 4 days. On August 4, increased convective activity was apparent from satellite imagery, ship reports in the area indicated that central pressures had dropped to 1000-1003 mb and weakening of the upper-level easterlies was indicated by the 200 mb analysis data. It became evident that the disturbance had indeed intensified, and that further intensification was likely. Upgraded to tropical storm status on August 6, Cecil turned southward, slowed to 3 kn, and then turned northwestward. From August 6 to 8, Cecil intensified from 35 kn to 115 kn, reaching a peak intensity of 125 kn at 1800 August 8 while located 120 mi east of Taiwan (fig. 14).

As Cecil approached Taiwan from the southeast, its track turned sharply northward until reaching 25°N when Cecil once again assumed a more northwestward track. Although Cecil never approached closer than 80 mi to Taiwan heavy rains associated with its peripheral circulation touched off landslides which killed at least 19 people in Wu-Koo County, near Taipei.

On August 10, Cecil turned toward the northnortheast and the combined effects of colder ocean temperatures, vertical wind shear, and

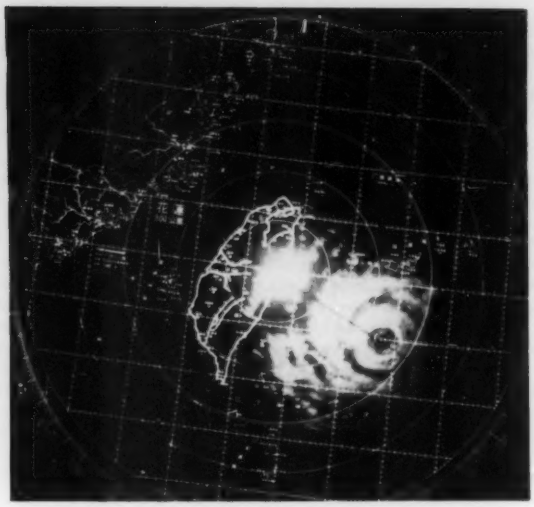


Figure 14.-- Typhoon Cecil as she appeared on Hua Lien radar at 1900 August 8. Photo courtesy Central Weather Bureau, Taipei, Taiwan.

cooler surrounding air began to take their toll. Within 3 days after reaching maximum intensity, Cecil was downgraded to a tropical storm. As a tropcal storm, Cecil continued to move northward in response to steering from an extension of the subtropical ridge which had built northward into the Sea of Japan.

By August 14, Cecil, located near 38°N 124°E, was beyond the northward influence of the subtropical ridge and entering an area of westerly flow. Cecil moved eastward in response to its new environment and made landfall on Korea with 35 kn winds. Although, at this time, Cecil was a weak storm in terms of wind intensity, there was agreat deal of precipitation associated with the circulation. Heaviest rains of 21.2 in were recorded in Sanchong, resulting in severe flooding which left 35 dead, 28 missing, and 42 injured in addition to an estimated $30 million in property damage. Cecil's circulation was unable to reorganize after crossing the Korean peninsula and dissipated in the Sea of Japan on August 15.

TYPHOON DOT

The origins of Typhoon Dot can be traced back to a weak surface circulation located near Kwajelein on the 5th of August. On August 8, a reconnaissance aircraft mission into the area showed that the circulation had maximum sustained winds of 20 kn but that the surface circulation was still very broad with relatively unorganized convection. Satellite imagery and 200-mb data indicated that an upper-level anticyclone was present in the area, although not vertically aligned with the surface center. The initial warning on tropical depression 13 was issued on August 9 when satellite imagery indicated that the cloud pattern associated with the developing depression was becoming more organized along with increased convective activity. A

reconnaissance aircraft mission observed surface winds of 35 kn and an extrapolated minimum sea-level pressure of 1003 mb. Tropical depression 13 was upgraded to tropical storm Dot at 0600. Dot moved westward and reached typhoon strength on August 11. After reaching a maximum intensity of 80 kn, Dot began to weaken as upper-level outflow channels became restricted due to interaction with typhoon Cecil located to the northwest. As the distance between Cecil and Dot increased over the next few days, Dot regained intensity, reaching maximum sustained winds of 60 kn on the 13th.

Dot continued westward along the southern periphery of the subtropical ridge toward Taiwan. Although Dot's passage over Taiwan was rapid, the rugged topography of the island had a devastating effect on Dot's low-level circulation. Dot never recovered from the effects of this crossing and dissipated less than a day later over the mountainous regions of eastern China.

TYPHOON ELLIS

Typhoon Ellis developed from a disturbance that was first detected within the monsoon trough south of Ponape on August 15. Once organized, development was quite rapid, with Ellis reaching a peak intensity of 125 kn on August 23.

At 0100 on August 18 satellite imagery identified a cloud mass near 8°N, 151°E that had acquired an upper-level outflow channel to the southwest. Based on continued convective organization, the first warning was issued for tropical depression 14 was upgraded to tropical storm Ellis. On the 19th Ellis began tracking more northwestward in response to weaker steering currents south of 15°N.

Ellis was upgraded to typhoon strength at 21/0000 when both aircraft and satellite data supported an intensity greater than minimum typhoon strength (64 kn). In the following days, Ellis continued to develop rapidly, passing 100 kn intensity on August 22 and peaking at 125 kn on the 23d. Ellis had shifted to a north-northwestward track as the subtropical ridge weakened south of Japan. Interestingly, the 14 warnings issued from 22/1800 to 26/000 consistently identified Ellis track within 30 mi of the eventual best track up to 29°N. As Ellis moved east of Okinawa on August 25 (fig. 15) its movement shifted toward the north.

Ellis commenced a rapid weakening trend as the combined effects of increasing vertical wind shear and interaction with the topography of Kyushu, Skikoku and western Honshu reduced Ellis to an estimated 45 kn intensity as it entered the Sea of Japan.

Ellis moved toward the north-northeast on August 26 and passed along Kyushu's eastern coastline and then just west of Hiroshima on the 27th. This jog to the north-northeast was costly for the region, as torrential rains (as much as 28 in. in 24 hr), flooding, landslides, and high winds brought much of southwestern Japan to a virtual standstill. Having left much of its fury behind, Ellis entered the Sea of Japan and rapidly transitioned into an

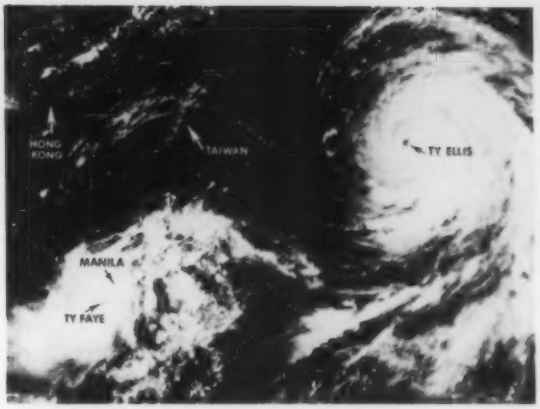


Figure 15.— Typhoons Ellis and Faye, 110 kn and 90 kn respectively at 0603 August 24. NOAA 7 Visual Image.

extratropical low-pressure system which would later move northwestward, passing 120 mi west of Vladivostok, USSR.

TYPHOON FAYE

Typhoon Faye proved to be one of the more difficult tropical cyclones to forecast during the 1982 season. The forecast history for typhoon Faye is a good example of what can happen when there is confusion in understanding the effect that the large-scale flow field and other larger tropical cyclones can have on a very small but intense cyclone.

Faye began a weak disturbance near Yap on August 16. The disturbance crossed the Philippines on the 20th and looped over the South China Sea east of Mindoro on the 21st and 22d. She reached tropical storm intensity early on the 21st and typhoon intensity late on the 22d on a northwesterly track prior to turning northward on the 23d. The typhoon moved up the west coast of Luzon on the 24th and 25th, crossing Manila Bay about 2000 on the 24th. Wallace Air Station suffered considerable damage from wind gusts up to 100 kn at 2200 on the 24th. She had reached maximum intensity of 90-kn sustained winds at 0600 (fig. 15). The terrain of Luzon weakened the storm below typhoon intensity by 0000 on the 25th.

The storm turned northeastward on the 26th and dropped to a depression again by the 27th. After being under the influence of typhoon Ellis, typhoon Gordon was developing to the southeast. On the 28th Faye again intensified to a tropical storm and by 1200 to a typhoon. She was a very small storm. Typhoon force winds extended only 10 mi from the center and above 30 kn out only 60 mi.

On the 29th Faye became quasistationary and looped counterclockwise and turned southward as a tropical storm and looped counterclockwise again late on the 30th. She dropped to a depression again on the 31st as she tracked westward. Typhoon Gordon was about 900 mi east of Faye (fig. 16). Faye persisted as a depression until September 3.

Figure 16.-- Typhoons Faye and Gordon at0502 August 29. Gordon was 100 kn at this time. NOAA 7 Visual Image.

TYPHOON GORDON

Typhoon Gordon developed rapidly from a disturbance which was initially detected on August 25 while it was embedded in an elongated monsoon trough along 8°N between 145°E and 175°E. Within 48 hr of its initial detection Gordon reached typhoon strength.

Rapid development occurred when the upper-level anticyclone moved over the surface circulation. Synoptic data from Truk Atoll and Ponape at 26/1200 also indicated intensification was occurring as gradient level winds increased to near 30 kn at both reporting stations. A reconnaissance aircraft investigative mission at 26/2347 was able to fix a circulation center near 14.5°N, 154°E with associated surface winds of 30 kn and a 1001 mb sea-level pressure. These data preceded the issuance of the first warning for tropical depression 16 at 27/0100. One day later, at 27/2335, reconnaissance aircraft data showed Gordon's central sea-level pressure had dropped to 977 mb and surface winds of 65 kn were observed in the north semicircle. During this period of intensification, Gordon was upgraded to tropical storm status at 27/0600 and typhoon status at 28/0000 based on reported aircraft data and steadily increasing cloud system organization. At 29/1800, 4 days after initial detection, Gordon's rapid intensification ended at 100 kn (fig. 16). Gordon was tracking northwestward. Strengthening of the subtropical ridge to the north resulted in the storm turning to the west-northwest on the 31st. Late on September 2 Gordon abruptly turned northeastward and accelerated to 22 kn. The storm passed 260 mi southeast of Tokyo. The U.S. Naval facility at Yokosuka, Japan reported maximum winds of 32 kn with gusts of 44 kn during September 3 and 4. He had transitioned to an extratropical storm by 0600 on the 5th near latitude 37°N.

TYPHOON IRVING

Typhoon Irving developed within an active monsoon trough anchored south of Guam in early September. Surface pressures throughout the region between 125°E to 165°E and 8°N to 13°N were below 1004 mb. On September 4, a low-level circulation was evident on visual satellite imagery near 11°N, 130°E. During this period, another tropical cyclone was developing in the monsoon trough near 12°N, 147°E (typhoon Judy (19)).

A warning bulletin for tropical depression 18 was issued by JTWC at 05/0855, when reconnaisance aircraft found a closed-off surface circulation with observed winds near 30 kn. Based on continued convective organization, tropical depression 18 was upgraded to tropical storm Irving at 05/1800.

From September 6 to 8 Irving remained equatorward of a strengthening subtropical ridge and maintained a westward track across the Philippine Sea. Irving made landfall on the southern tip of Luzon on the 8th. Maximum winds at landfall were 60 kn. Irving assumed a northwestward path through the Sibuyan Sea and remained over a marine pathway between the islands of the central Philippines. Irving entered the open waters of the South China Sea, 27 mi southwest of Cubi Point Naval Air Station at 09/1700. NAS Cubi reported sustained winds of 46 kn with a peak gust of 64 kn.

As Irving moved into the South China Sea, a return to a more westward track and gradual intensification were forecast. Irving turned northeastward on the 11th and reached typoon strength on the 12th. Aircraft reconnaissance on the 12th reported a maximum observed surface wind of 90 kn. The aircraft data also indicated that Irving had a very tight circulation, with the radius of 50 kn winds within 60 mi of the center during this period of maximum intensity.

On 15 September, as the system began to interact with Hai-nan Island and the coast of China, Irving was downgraded to tropical storm strength. Irving made landfall 110 mi northeast of Hanoi late on the 15th and thereafter rapidly dissipated over the mountainous area of Vietnam.

TYPHOON JUDY

Typhoon Judy, along with typhoon Irving developed within the same active monsoon trough. The first warning for tropical depression 19 was issued on the 5th. The first reconnaissance mission was conducted late on the 5th and reported 45 kn surface winds and a 994 mb minimum sea level pressure. Tropical depression 19 was upgraded to tropical storm Judy on the 06/0000 warning. Judy tracked northwestward toward eventual recurvature east of Okinawa. Judy reached a maximum intensity of 90 kn on the 9th (fig. 17). She turned northeastward on the 10th and the north-northeast on the 11th and accelerated toward Japan.

At 0800 on the 12th, Judy made landfall upon Omaezaki Point in Shizuoka Prefecture, southeast of Nagoya. Judy moved rapidly over the mountainous region of central Honshu and entered the eastern portion of the Sea of Japan where extratropical transition followed. In its wake, Judy left at least 25 dead and the accompanying torrential rains and floods damaged more than 61,000 houses, washed out sections of

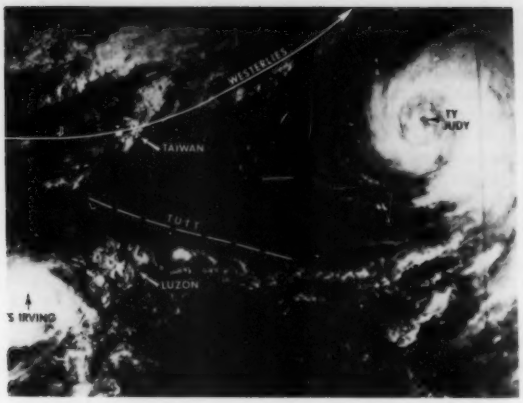


Figure 17.-- Typhoon Judy at 90 kn at 0601 September 10.The Tropical Upper-Tropospheric Trough separates Judy and tropical storm Irving. NOAA 7.

956 highways and swept away 46 bridges in an area stretching from Osaka in the south, to Hokkaido in the north.

TYPHOON KEN

Satellite imagery on September 14 and 15 showed a persistent convective disturbance near 17°N, 134°E with evidence of upper and lower level circulation centers. A reconnaissance aircraft mission early on September 16 found a surface circulation near 18°N, 133°E, with 10 to 35 kn winds and a minimum sea-level pressure of 1003 mb.

Ken was named a tropical storm on the 16/1200 warning after aircraft reconnaissance reported a 999 mb central pressure. Ken tracked northwestward and 33 hr after the inital warning was issue, Ken was upgraded to typhoon status when aircraft reconnaissance data showed a central pressure of 976 mb, equivalent to an intensity of 65 kn. Ken underwent a rapid intensification during the following 24 to 36 hr, with its intensity surpassing 100 kn on September 18. Up to this point in its development Ken was characterized as a compact system; for example, aircraft data at 18/0600 indicated a 938 mb central pressure in a 10 mi diameter eye with a maximum surface wind of 100 kn located within a band of maximum winds only 15 mi from the center. Ken became quasi-stationary on September 20 (figure 18 shows Ken at his westernmost position) and the character of the associated circulation pattern began to change dramatically; aircraft reconnaissance missions found the center expanding, with the strongest wind bands moving away from the center.

Ken's eye was last observed at 21/2011 during a double-fix aircraft mission. On the first penetration, the mission Aerial Reconnaissance Weather Officer (ARWO) indicated the eye was 7 mi in diameter but on the second penetration, at 21/2327, the ARWO reported "... the eye was so large we couldn't even pick it up on our radar ..." Further, the band of maximum winds

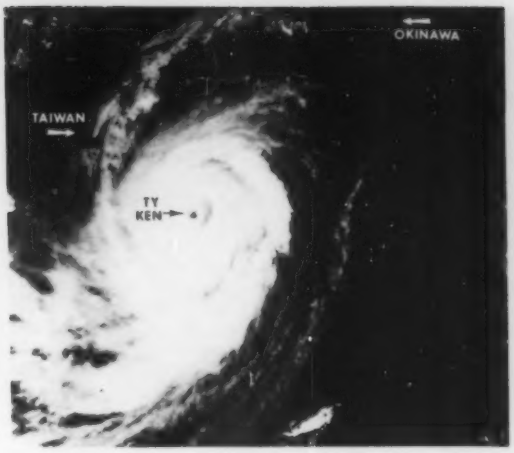


Figure 18.-- Ken at 0542 September 20 about 36 hr prior to the eye expanding drastically. NOAA 7.

were observed some 60 to 95 mi from Ken's center.

Ken began to move erratically toward the northeast and was on a steady course toward Okinawa. Ken passed 78 mi southeast of Okinawa; maximum winds recorded at Kadena AB were 35 kn and a peak gust of 58 kn. Ken also brought a significant, and much needed, rainfall to Okinawa; 11.09 in were recorded at Kadena on September 23. Once past Okinawa, Ken began to gradually weaken. Ken made landfall upon Shikoku at 24/1700, crossed the Inland Sea, and then moved through western Honshu into the Sea of Japan where it became extratropical by the 25th.

Ken was the fourth typhoon of the season to hit the main islands of Japan; it brought torrential rains and high winds, which triggered mudslides that flooded or wrecked thousands of homes and paralyzed both air and ground transportation. Reports from the region indicated that a peak gust of 114 kn was recorded on Shikoku during Ken's passage along with 8.7 in of rain over one 6-hr period.

SUPERTYPHOON MAC

Supertyphoon Mac was spawned to the east of Ponape on September 28. The first warning on tropical depression 23 was issued at 1200 on October 1 after nearby SHIPBOARD OBSERVATIONS indicated that the surface pressure was as low as 1003 mb and that surface winds had risen to 25 kn.

Because of tropical depression 23's location near 12°N,150°E, it was apparent that the system presented a significant threat to the island of Guam. Initial forecasts proved accurate as Mac passed 10 mi southwest of Guam at 03/0000. Although maximum sustained winds within Mac were estimated to be 60 kn at closest point of approach to Guam, the highest sustained winds recorded at Nimitz Hill, from Mac's center, were just 30 kn. Guam experienced little

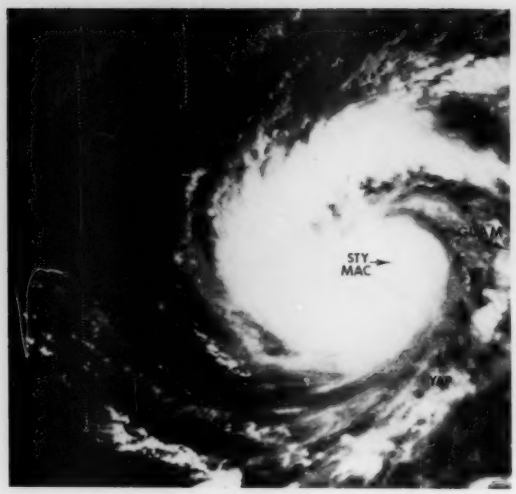


Figure 19.--Supertyphoon Mac at 0640 October 5 about 11 hr after maximum intensity. NOAA 7.

structural or equipment damage because of the fortunate combination of adequate advance warning and preparation, and the compact wind radii associated with Mac. However, crop damage was extensive in the southern part of the island due to the heavy rains and relatively high winds experienced there; the Government of Guam Department of Agriculture estimated damages at $1.5 million.

Mac continued to intensify rapidly after passing Guam. In 2 days, from the 3rd to the 5th, Mac more than doubled its intensity from 60 kn to 140 kn (fig. 19). Figure 20 shows the trends of various meteorological parameters over Mac's lifetime. The 700 mb data and minimum sea level pressure (MSLP) were derived from reconnaissance aircraft data. Items of particular note include: the dewpoint depression of 28°C, one of the largest ever recorded in a tropical cyclone; the redevelopment to super typhoon strength, only the sixth recorded instance since 1958; the correspondence of the MSLP trends and intensity peaks; and the relatively smooth intensity trend as presented by Dvorak analyses.

On October 5 and 6, after having attained supertyphoon strength, Mac turned sharply north-northeastward and accelerated Mac dropped below supertyphoon intensity at 1800 on the 5th but regained it for a few hours on the 6th. Mac never posed a threat to Japan even though it appeared to be right on course toward Tokyo until October 8. Once embedded in the mid-latitude westerly flow, Mac accelerated to a maximum forward speed of 28 kn but lost little

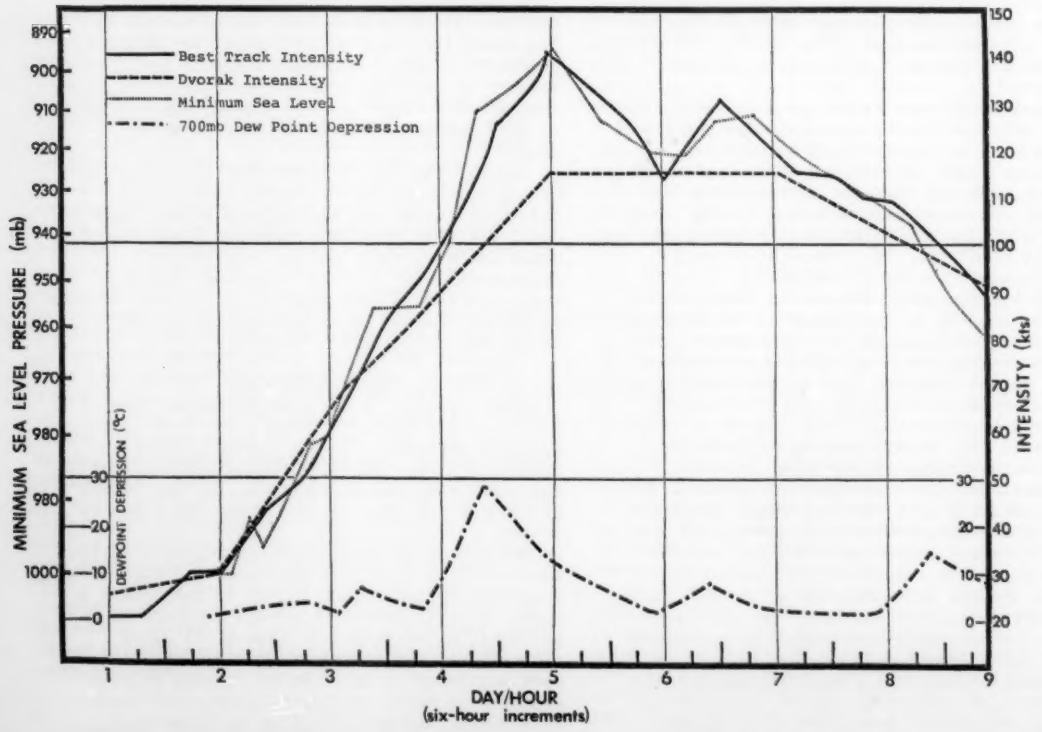


Figure 20.-- A comparison of best track and Dvorak estimate intensities, minimum sea-level pressures, and 700 mb dewpoint depressions for the first 8 days of Mac. Annual Tropical Cyclone Report, 1982.

of its intensity. Two days after its recurvature, Mac's intensity had dropped only 30 kn, i.e., from 125 to 95 kn. Although Mac remained intense, it rapidly lost its tropical characteristics and transitioned into an extratropical system on October 9.

TYPHOON NANCY

An upper cold LOW drifted westward and was located near 16°N,148°E on October 10. Conditions were right for cyclogenesis - the upper-level divergence coupled with a pre-existing low-level cyclonic circulation and a tropical depression formed. An alert was issued for the area 200 mi north of Guam due to the 1005 mb surface pressures and the significant increase of cloud pattern organization. The initial reconnaissance aircraft located a closed circulation and surface winds of 25 kn which prompted the first warning at 0200 October 11. Upgrading from tropical depression to tropical storm status followed within 6 hr. Nancy stabilized at moderate tropical storm strength and maintained a westward track.

Nancy began to intensify and on October 13 Nancy attained typhoon strength and then rapidly deepened to a peak intensity of 115 kn just 6 hr prior to landfall on northeastern Luzon. Nancy was reduced to tropical storm strength by a rugged overland transit, but was quick to regain typhoon strength upon reaching the open waters of the South China Sea. Nancy was the most intense typhoon to strike the Republic of the Philippines this year; in its wake, Nancy left at least 110 dead, 12,000 people homeless, and caused an estimated $46 million damage.

At 16/1200, Nancy reached a second peak intensity of 80 kn as it passed just north of the Paracel Islands. The influence of a subtropical ridge over southern China and the continuing presence of the low-level northeasterly (monsoon) flow across the South China Sea kept Nancy on a westward track until it approached Hai-Nan Island late on October 16. From near Hai-Nan until landfall, Nancy maintained a slower, northwestward track. On October 18, Nancy crossed the coast of Vietnam 15 mi north of the city of Vinh in the Nghe Tinh province, causing at least 71 deaths, leaving 194,200 people homeless, and devasting 185 square miles of winter rice crops that were rady for harvest. Later satellite imagery indicated that Nancy's central convection had dissipated over the mountains of Vietnam.

TYPHOON OWEN

Typhoon Owen culminated an active 14-wk period from July 22 through October 27 during which 17 tropical cyclones reached warning status in the western North Pacific. During this period, only 10 calendar days did not have at least one tropical cyclone in warning status, with 5 days (September 26 to 30) the longest period without warnings. So obvious was the cessation of this period that four weeks elapsed between the final warning on Owen and the initial warning on the next tropical cyclone, Pamela.

Owen was first detected on October 13 east of Kwajalein Atoll. By late on the 15th convective features were indicative of a system of sufficient intensity to warrant transition to warning status. Owen was named at 0000 on the 16th.

Owen was another example of non-vertical alignment of developing tropical cyclones. Such systems normally become better aligned as they mature and Owen was no exception; on October 18 and 19, the tilt became less evident and Owen responded by attaining typhoon strength at 18/1200 and developing a banding-type eye on October 19. Owen also turned sharply northward. From October 19 to 21, Owen accelerated northward toward an anticipated extratropical transition, reaching a peak intensity of 105 kn. By the 22d he was considered extratropical and turned southeastward.

On October 23 an increase in convective activity was noted equatorward of the system center and during the next 24 hr it was closely monitored for possible reclassification as "tropical" vice "extratropical" or "subtropical" cyclone. The decision to redesignate Owen as a tropical cyclone occurred on October 24 when the convection began to reorganize around the system's center. For the next 24 hr, Owen tracked eastward and maintained an estimated 50 kn intensity. Satellite fixes on October 25 indicated a pronounced northward track and a steady decrease in convective activity. Owen moved north-northwestward then northeastward, and slowly weakened and dissipated in the warm sector of an advancing frontal system some 1400 mi north of its point of initial detection after completing a track in excess of 3600 mi.

TYPHOON PAMELA

Typhoon Pamela, the 27th significant tropical cyclone of the season, formed east of the Marshall Islands on November 24. Uncommon for a late season tropical cyclone, Pamela went on to become the longest running, in terms of time and distance, tropical cyclone of the year before dissipating in the South China Sea on December 9. During its active warning period, Pamela was upgraded to typhoon status on four distinct occasions (reduced to three in post-analysis), a very rare phenomenon.

Development was first observed on November 21 and was upgraded to tropical storm Pamela at 1200 on November 24. Pamela moved west-northwestward through the Marshall Islands in the ensuing 84 hr. Satellite and aircraft reconnaissance data confirmed the gradual intensification of the system, with Pamela attaining typhoon status at 26/0600 while passing approximately 60 mi south-southeast of Kwajelein Atoll. By the time Pamela passed 35 mi southwest of Enewetak Atoll at 27/1200, its intensity was estimated (from aircraft data) to be 95 kn (fig. 21). Initial reports from the Marshall Islands indicated moderate to severe damage to buildings and crops from those islands affected by Pamela's passage, but there were no reports of loss of life.

As Pamela approached 19°N it began to rapidly weaken as it encountered a mid- to upper-level shear zone associated with a trough. Evidence

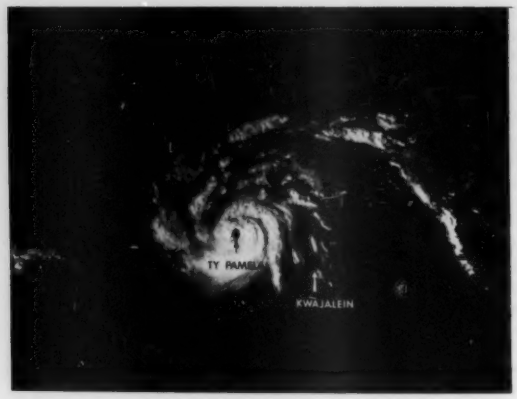


Figure 21.-- Typhoon Pamela at 0348 on the 27th, 15 hr prior to maximum intensitv of 100 kn. NOAA 7.

of the rapidity with which Pamela weakened is seen in the aircraft reconnaissance data. At 28/2105, a central pressure of 950 mb and an observed 100 kn surface wind were reported. A second reconnaissance mission about 9-1/2 hr later at 29/0640 reported a 979 mb central pressure and observed surface winds of only 50 kn. This second report necessitated the downgrading of Pamela to tropical storm status on the subsequent warning. A much-weakened Pamela then moved toward the southwest and began to accelerate after breaking away from the effects of the trough and shear zone. Pamela accerlerated toward the southwest until 30/1200 when it began to move westward. During this period, Pamela continued to weaken.

Although Pamela was still weakening, it was considered a potentially dangerous tropical cyclone. At 1200 December 1, Pamela was located 90 mi southeast of Guam and was moving westward at 23 kn; its closest point of approach to Guam came 2 hr later with the maximum recorded wind gusts of 40 kn, far below the 138 kn gust observed during supertyphoon Pamela in 1976. Pamela was downgraded to a depression on the 2d. Later aircraft reconnaissance indicated she had regained tropical storm strength. Reconnaissance aircraft missions showed that Pamela was continuing its reintensification and it again passed from tropical storm status to typhoon status at 1200 December 4. Pamela reached a maximum intensity of 80 kn.

Pamela continue tracking west-northwestward and completed a small anticyclonic loop on the 5th and the moved southwestward toward the Philippines. Early in the loop, Pamela began to interact with the mid-latitude westerlies and once again the effect of increased vertical wind shear weakened Pamela from 80 kn to 50 kn over a 30-hr period. However, as Pamela moved southwestward, the subtropical ridge to the north began to strengthen at all levels, allowing Pamela to reintensify to a typhoon for the third time. Pamela reached a maximum intensity of 70 kn about 6 hr prior to entering the islands of the central Philippines.

As Pamela moved through the Philippines and weakened, tropical depression 28 (Roger) formed in the Philippine Sea. The combined effects of interaction with the topography of the islands and a shift in the low-level wind regime toward Roger caused Pamela to weaken rapidly and eventually brought on its dissipation over the South China Sea. Pamela had traveled 4,291 mi.

TYPHOON ROGER

Roger was particularly interesting in that it followed closely on the heels of typhoon Pamela. Both systems remained south of the subtropical ridge axis, moved to a mid-tropispheric neutral point near northern Luzon and were profoundly affected by the passage of a mid-latitude trough. In sharp contrast to Pamela, which was a long-lived, significant tropical cyclone, Roger remained an incipient circulation for 4 days.

The first hint of formation occurred at 0600 December 3 when a large area of convection appeared in an upper-level divergence pattern 1200 mi southeast of typhoon Pamela. The low-level circulation center was displaced 150 mi south of the cloud system center. This tilt was present until December 7 and was, most probably, responsible for the long period of slow development.

While Pamela moved into the central Philippines and weakened, Roger remained over water and underwent rapid intensification. The low-level wind circulation center and the cloud system center became vertically aligned and Roger gained tropical storm strength at 07/1200. Roger continued to move toward the northwest along the coast of the Philippines and intensified to typhoon strength at 0000 on the 9th. Roger again weakened to tropical storm intensity and moved northward along the east coast of northern Luzon. Satellite imagery revealed that a long cirrus plume was developing from Roger and streaming northeastward as the vertical shear increased aloft (fig. 22) The storm was downgraded to a depression on the 10th and dissipated the next day.

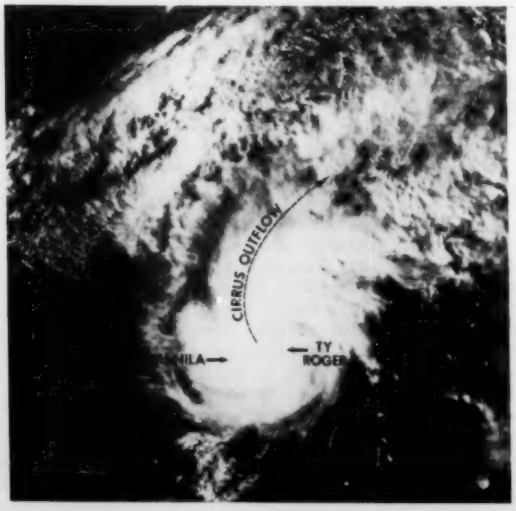


Figure 22.-- This NOAA 7 image shows the cirrus outflow north of Roger.

NORTH INDIAN OCEAN TROPICAL CYCLONES

The North Indian Ocean tropical cyclone season was near normal. Five tropical cyclones reached warning status, two developed during the spring monsoon transition season and three developed during the fall transition season. One tropical cyclone developed in the Arabian Sea and the other four formed in the Bay of Bengal. Tables 5 and 6 provide a summary of the Tropical Cyclones and figure 22A their tracks.

Table 5.-- Summary of North Indian Ocean tropical cyclones

NORTH INDIAN OCEAN

1982 SIGNIFICANT TROPICAL CYCLONES

TROPICAL CYCLONE	PERIOD OF WARNING	CALENDAR DAYS OF WARNING	NUMBER OF WARNINGS ISSUED	MAXIMUM SURFACE WIND (KT)	ESTIMATED HELP (MB)	BEST TRACK DISTANCE TRAVELED (NM)
1. TC 20-82	2 MAY - 5 MAY	4	14	135	914	1135
2. TC 23-82	2 JUN - 4 JUN	3	8	95	983	482
3. TC 23-82	14 OCT - 16 OCT	3	9	80	986	681
4. TC 24-82	17 OCT - 19 OCT	3	7	80	987	389
5. TC 25-82	5 NOV - 9 NOV	5	17	90	952	949
	1982 TOTALS:	18	55*			

* IN ADDITON, TWO AMENDED WARNINGS WERE ISSUED DURING 1982

1982 SIGNIFICANT TROPICAL CYCLONES

NORTH INDIAN OCEAN	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
ALL TROPICAL CYCLONES	0	0	0	0	1	1	0	0	0	3	1	0	5
1975-1981													
AVERAGE	.1	-	-	.1	.7	.6	-	-	.6	.9	1.4	.6	4.6
CASES	1	0	0	1	5	3	0	0	3	6	10	3	32

FORMATION ALERTS: Five of the nine Formation Alert Events developed into significant tropical cyclones.

WARNINGS:

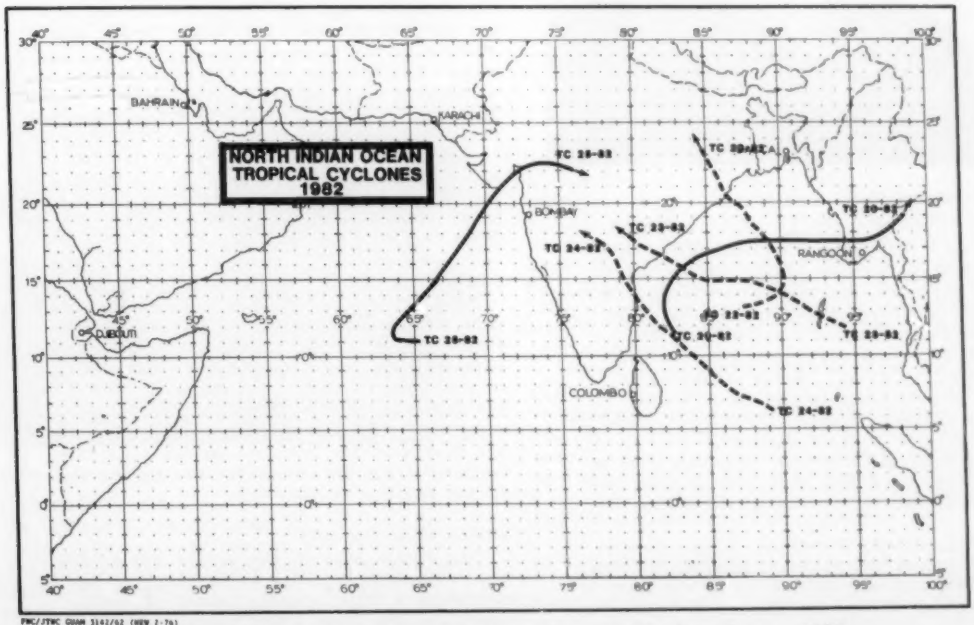
Number of warning days:	18
Number of warning days with two tropical cyclones in region:	0
Number of warning days with three or more tropical cyclones in region:	0

Table 6.-- Frequency of North Indian Ocean tropical cyclones by month and year

FREQUENCY OF TROPICAL CYCLONES BY MONTH AND YEAR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1971*	-	-	-	-	-	0	0	0	0	1	1	0	2
1972*	0	0	0	1	0	0	0	0	2	0	1	0	4
1973*	0	0	0	0	0	0	0	0	0	0	2	1	3
1974*	0	0	0	0	0	0	0	0	0	0	1	0	1
1975	1	0	0	0	2	0	0	0	0	1	2	0	6
1976	0	0	0	1	0	1	0	0	1	1	0	1	5
1977	0	0	0	0	1	1	0	0	0	1	2	0	5
1978	0	0	0	0	1	1	0	0	0	1	1	0	4
1979	0	0	0	0	1	1	0	0	2	1	2	0	7
1980	0	0	0	0	0	0	0	0	0	0	1	1	2
1981	0	0	0	0	0	0	0	0	0	1	2	1	3
1982	0	0	0	0	1	1	0	0	0	3	1	0	5
1975-1982													
AVERAGE	.1	-	-	.1	.8	.5	-	-	.4	1.0	1.4	.4	4.6
CASES	1	0	0	1	6	4	0	0	3	8	11	3	37

* JTWC warning responsibility began on 4 June 1971 for the Bay of Bengal, east of 90E. As directed by CINCPAC, JTWC issued warnings only for those tropical cyclones that developed or tracked through that portion of the Bay of Bengal. Commencing with the 1975 tropical cyclone season, JTWC's area of responsibility was extended westward to include the western portion of the Bay of Bengal and the entire Arabian Sea.



FNC/JTWC GUAM 5161/62 (REV 2-76)

Figure 22A.-- Tracks of North Indian Ocean tropical cyclones, 1982.

Marine Observations Program

J. W. Nickerson
National Weather Service/NOAA
Silver Spring, Maryland

NEW PORT METEOROLOGICAL OFFICERS

Howard R. Schultz, Jr., Saulte Ste. Marie, Michigan. Howard (fig. 23) volunteered for PMO work at the start of the 1983 boating season but hasn't been able to get underway because of other duties at the Soo Weather Service Office (WSO). He has been with the National Weather Service since 1976 in Nebraska and Virginia. The last 4 years have been at the WSO at the SOO.

Figure 23.--Howard R. Schultz, Jr., Saulte Sainte Marie, Michigan.

He started his meteorological career with the Air Weather Service, USAF. He served in Germany, Nebraska, and Washington State. While at McChord Air Force Base, Tacoma, Washington, he worked in the Marine Forecast Section producing forecasts for Puget Sound and the coastal Pacific areas. While at Tacoma he received an Associate Degree from Tacoma Community College, Tacoma, Washington. He left the Air Force as a Staff Sargeant.

He was born in Cleveland, Ohio and grew up there and northern Ohio before he joined the USAF. He is married to the former Anita (N) McGowan.

George E. Smith, Cleveland, Ohio. George (fig. 24) joined the National Weather Service in June 1982 and volunteered to be the Port Meteorological Officer at Cleveland, Ohio in time for the opening of the boating in 1983.

He received his meteorological training while in the U.S. Air Force from 1960 through

Figure 24.--George E. Smith, Cleveland, Ohio.

1982. He also took courses at the University of Alaska and the University of Maryland during this period. His last duty station was in Pittsburgh, Pennsylvania, where he was the advisor to the Pennsylvania Air National Guard unit. In 1982 that unit was awarded the nationwide National Guard Association and the USAF awards for the outstanding Guard Weather Unit.

George was born and grew up in Elyria, Ohio a few miles south of Lorain. He is married to the former Carol Jean Berchak of North Ridgeville, Ohio. They have three children, Douglas 19, Scott 16, and Kimberly 14.

SOME NOT TO GET SPRING MARINERS WEATHER LOG

From the summer MWL, we learned that there were 158 commercial and 1,171 recreational marine fatalities in 1982. Many were weather related and we are once again facing the stormy winter season. Mother nature is difficult when she gets her feet wet, but she becomes a real witch when she gets wet and cold. Winter is the season of the greatest marine disasters. Be careful and be around for the spring issue of the Mariner Weather Log.

WINTER WIND AND WAVE

The oceans prevent the winter hemisphere of the earth from becoming a big block of ice by providing a very valuable source of heat. Ocean and the Great Lakes temperatures lag behind the changes of sunlight (the source of heat) and the air temperature by several weeks. Ocean temperatures never get as cold as the

land during the winter season making the coastal areas warmer than the interior.

When the water is warmer than the air, the air becomes turbulent and unstable, and the wind becomes strong and gusty. Air in contact with the water is heated, expanded, and pushed away from the surface. Cooler, heavier air rushes in to replace it, is also heated and the cycle continues. You can feel this as puffs of wind and you can see it on the water surface. The water surface is rougher than normal both on a large scale and also on a very small scale. The little wavelets are steeper and more pronounced as the puffs of wind hit the surface like a fist. This also has a cumulative effect and causes the waves to be higher and steeper than in the spring and summer, or anytime when the air temperature is the same or warmer than the water. When the water is warmer than the air the transfer of energy from the wind to the water is at its greatest efficiency because of unstable, turbulent air.

STEAM FOG

When very cold, dry air blows off the continent over the warmer water of the oceans, lakes, and rivers in the winter, a phenomenon called steam fog or sea smoke often occurs. The water evaporates extremely fast, but because of the cold temperature, condenses into a vapor cloud or fog almost immediately. In most cases the visibility between these plumes of vapor is often very good. The plumes usually spread at a very low altitude into a turbulent, often rapidly moving, thin, ragged cloud deck. Visibility and radar refractive conditions change rapidly. The front cover and figure 25 show rather spectacular steam fog conditions.

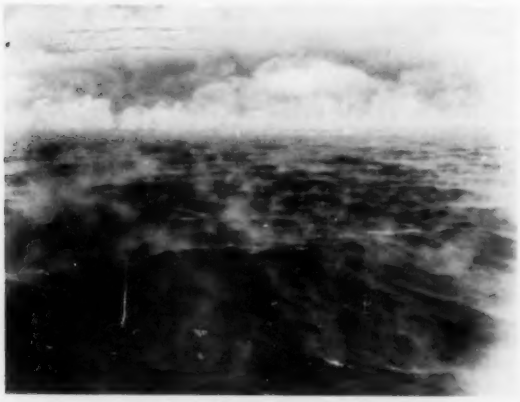


Figure 25.-- Steam fog, cold air over warm water.

SUPERSTRUCTURE ICE

As the water temperatures fall to near freezing (they already have in the Arctic) superstructure ice can form from spray and be a killer. Any superstructure ice is cause for concern whether it is caused by spray or precipitation, as conditions can worsen rapidly, sometimes too fast to control. Superstructure ice should be immediately reported by special report (SPREP). See page 1-9 of the NWS Observing Handbook No. 1 (NWSOH No. 1).

STORMS

Storms are cyclones that reach beaufort force 10, or over 48 knots of wind. Winter storms sometimes reach hurricane force. Although they may not reach the extreme high wind speeds of the tropical cyclones (hurricanes and typhoons), they usually have a much larger area of gale force and above winds. Combined with the turbulent transfer of energy, explained earlier, and the long fetches, the waves in winter storms are usually unparalleled.

Please use the prefix STORM, as explained in the, NWSOH No. 1, page 1-9, on all weather reports with wind 48 knots or higher. You do not have to wait for the synoptic hour, but should report these conditions whenever they occur. If possible, please report at least every 3 hr while under storm conditions and as often as each hour if conditions permit.

EXTREME STORM WAVES

Most reports of Extreme Storm Waves (ESW) occur during the winter. The ESW appears to occur most frequently during the rapid deepening phase of storms when the wind is increasing rapidly. However, in some cases the ESW seem to run out ahead of the probable development area. The most likely development area seems to be in the high wind area immediately to the south and west of the storm center.

The main characteristics of the ESW are:

- o Long, level crest. Often described as being "from horizon to horizon."
- o Verv steep and high. Described as a "huge surfing wave at sea," a "wall of water."
- o Preceded by a deep trough. Described as a "hole in the sea," a "bottomless pit."

The ESW may be a single wave, or up to a group of three. They appear "ready to break" because of their steepness and a usually foamy crest, or in some cases, are actually breaking. We don't know how long they last, although they have been detected by radar. Be alert to any line echo on the radar at fairly short range, but not necessarily parallel to the wave crests in the seaway.

One of the greatest dangers of an ESW is that it may come from a direction off the waves in the seaway; sometimes over 50 degrees. In most situations this will be to the right of the direction from which the seaway waves are coming in the northern hemisphere (to the left in the southern hemisphere). We need more data and photographs for this research.

WEATHER OBSERVATIONS

Don't fight the winter storms as a loner. You need every bit of information you can get for your own safety and the safety of your ship and cargo. If every ship puts out that extra effort to make the observations and get them

transmitted immediately, the forecast offices would have more data to make better forecasts. Even with the decreases in world commercial ships over the last few years you have managed to increase the number of observations. A very well done to all concerned. Here are the latest statistics of the last few months:

Month, 1983	U.S. Radio	U.S. & GTS
March	26,477	91,471
April	27,133	88,328
May	31,044	91,238
June	29,491	94,505
July	31,181	90,641
August	33,728	99,118

The GTS or Global Telecommunications System carries weather observations relayed by radio stations all over the world.

HOW OFTEN

STORM and SPREP reports (see NWSOH No. 1, page 1-10) - hourly if possible, otherwise 3-hourly. Often one observation can make the difference and cause revised forecasts and warnings. Just the information you need. Figure 26 illustrates this point quite well.

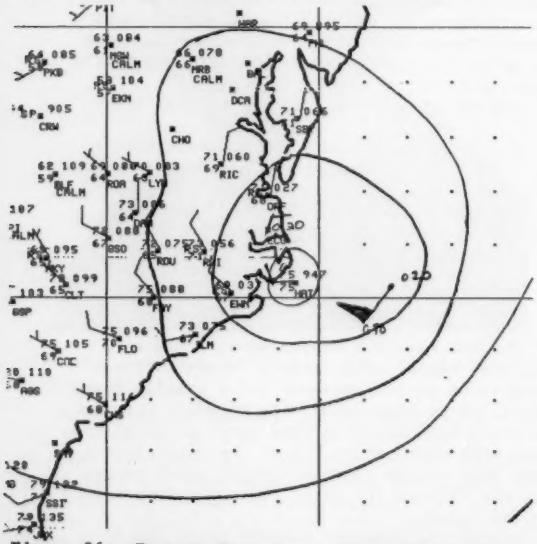


Figure 26.--Excerpt from east coast weather map 13Z (hourly aviation), June 19, 1982. The highest wind at a coast station is 10 kn, yet the ship 130 mi east of Hatteras has an average wind of 50 kn with gusts to 70 kn.

HOW CLOSE TO THE COAST

Any time the ship is underway, even in bays like Chesapeake and San Francisco, please make at least the minimum report. Who else is out there? Who else knows the weather at your position? We know the weather changes, sometimes dramatically, in the first few miles off the coast. We need your coastal observations to tell when, where, and how much. Look again at figure 26, you can see how different the wind and weather is over the ocean compared to the land conditions. Even Hatteras had a land wind of only 10 kn. The wind offshore must have increased rapidly to have a report of 50 kn with gusts to 70 kn only 130 mi off the coast.

THOSE DUMB COMPUTERS

When we poked into the data stream to find out how things were going we found some observations being dumped. The problem is missing radio call signs or rearranged observations. The computer does only what it is programmed for and can't make exceptions. The computer expects to find a call sign 5 characters back from the group identification "99." When it doesn't, it drops that observation and goes on to the next. Please make a quick review of NWSOH No. 1 so none of your ship's observations are omitted from the computer runs. The ship's call sign and the first five groups, through the wind group, must be sent, and in the proper order, to make the system work.

TIMELY OBSERVATIONS

First, all observations are used, even those that are very late. However, the later they are the less is the bang for your efforts. There are hourly weather maps as in figure 26. That is the 1300 Z aviation weather map, but the forecaster adds any ship reports by hand, as in this instance. Then there are others, including computer products, every 3 hr. The big one for the ships are the synoptic maps, every 6 hr. Based on these synoptic data there are a string of special maps and computer products all designed to help the forecaster make his decisions on the forecast. The early data makes it all. See the graph under Tips to the Radio Officer.

SINGLE SIDEBAND OBSERVATIONS

The ship observation on figure 26 was transmitted by single sideband (SSB). The Pride of Baltimore (Summer 1982 MWL) experimented with using the ship synoptic code over SSB radio by phonetically pronouncing the numbers. SSB has been used to give verbal weather reports for many years, but verbal descriptive reports do not get into the computer guidance, and often are only used locally. When you use the ship synoptic code it is treated exactly like a CW (morse code) ship report. It goes into the computer guidance products and gets system-wide distribution as a ship observation. That is the maximum bang for the effort!

Incidently, in the last couple of months we have had several reports of nighttime and coastal ship observations by SSB using the numerical ship synoptic code. Keep up the good work, every observation helps complete a map.

I GOOFED

My thanks to Captain Arthur Blackham of Noble Denton & Associates Limited, London, England for pointing out an error and some rough spots in the Spring 1983 MWL.

Page 83, top right column, "If there are no swells omit all swell wave groups." This is

wrong. It should have read -- "If there are no swell, $3d_{w1}d_{w1}d_{w2}d_{w2}$ should be entered 30000 and groups $4P_{w1}P_{w1}H_{w1}H_{w1}$ and $5P_{w2}P_{w2}H_{w2}H_{w2}$ should be omitted." As with the wind waves, it is important to know that there are no swell and not just that the groups were omitted. The 30000 says there are no swell waves.

Same column, please make the following correction to the table to read:

- o Page 2-126, Table 2.0, line through "99 Direction indeterminate."

PHOTOGRAPHS

We need wave, cloud, and weather photographs to illustrate manuals and publications. Does anyone have photos of the various observation procedures, i.e., use of the sling psychrometer and sea water dip measurements, apparent wind indicators, etc.? Please send permission to use the photographs in any and all publications.

MYSTERIOUS LOSS OF SPEED

We have a report of a considerable loss of speed by a vessel in the Gulf of Mexico. The vessel was drawing 21 ft and the engine was functioning normally, delivering turns for 11.3 kn, all during the period. On April 9, 1982, 0148 hr, at a position of 23.3°N, 94.3°W in the Gulf of Mexico, headed south for Coatzacoalcos, Mexico, the speed checked at 11.3 kn. The subsequent two fixes, one in the morning and one before noon, showed a speed of advance of 6.7 kn and 7.5 kn respectively. The noon position on April 9 was 21.9°N, 94.3°W which gave a noon to noon average speed of 9.2 kn.

The master reports the weather during the period was "good" and should have no bearing on the situation. There was a low swell from the southwest, sea water temperature of 26°C, (which remained steady), and a sand/dust haze.

Anyone in the Bay of Campeche area during this period please send me a write up of your experiences. Maybe we can find a reason for this speed loss.

I have heard of "dead water" in rivers and bays, and in the river outflows of large rivers like the Nile, Amazon, Congo, and Mississippi far at sea. "Dead water" is where there are two layers of water of different density traveling at different speeds. When the hull depth of the vessel coincides with the thickness of the upper layer and the propellers are in the lower layer, strange things happen. The props are pushing the water in the lower layer, but the hull is being affected by the current in the upper layer. This sometimes results in the loss of part or all of the effect of the propellers, hence the name, "dead water."

MAILING WEATHER RECORDS

We receive several packages of weather records, "Ship's Weather Observations," NOAA Form 72-1A's and WS Form 455-12 "Barogram" each month with incorrect addresses.

Mismailings, such as this, delays getting your observations reviewed and corrections made if necessary. Sometimes the data is delayed getting to the Mariners Weather Log. It causes extra work for several offices not in the marine program and, finally, there are an unknown number of these data packages that may be lost in the multiple handlings.

The correct procedure is to mail you completed forms (NOAA Form 72-1A, WS Form 455-12, and NOAA Form 72-4A if commercial radios or INMARSAT are used) to your servicing Port Meteorological Officer (PMO). The PMO addresses are listed on page 1-14 of the NWSOH No. 1 and also in this magazine (back cover).

MILLIBARS TO HECTOPASCALS

The official pressure measurement is now the Pascal. The hecto-Pascal (hPa) is the same as the millibar (mb). Eventually the hPa will replace the mb in the literature, but for many years they will be used side by side.

BONUS WEATHER BOOKS

About a year ago the Marine Observations Program purchased a number of paperback books on weather for the libraries of the ships in our observing program. I understand there are still some available.

The ocean book is:

"Marine Weather" by Nathaniel Bowditch, 1977 edition published by Defense Mapping Agency Hydrographic Center.

The Great Lakes book is:

"Weather and Climate of the Great Lakes Region" by Val Eichenlaub, 1979

These books are intended to help the observer better understand the weather. For the ship observers that do not have a copy of the appropriate book in the ship's library, write your servicing PMO and he will mail you one or bring it aboard on his next visit.

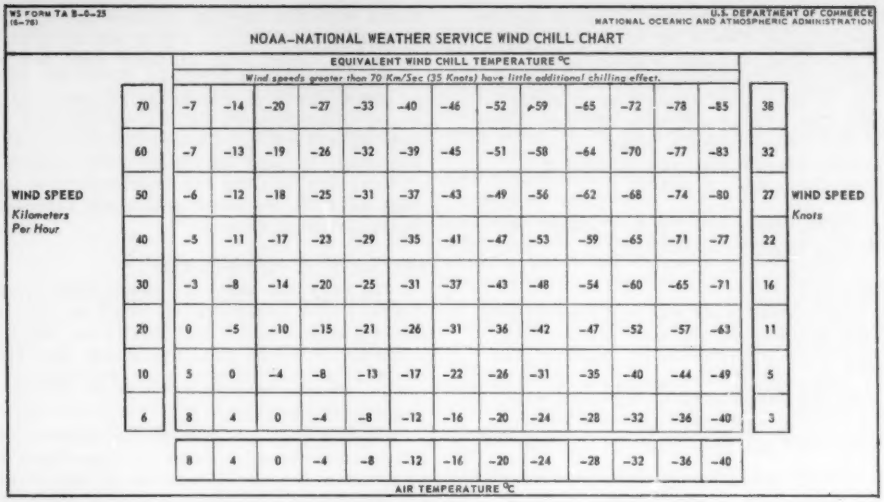
For the ships that are primarily ocean going, but do visit the Great Lakes, there is a section on the Great Lakes in the "Marine Weather" that should be adequate.

As we say in the accompanying letter inside the front cover, the book is to show our appreciation for the weather observations and radio weather reports received. There are no qualifications other than being a weather observing ship in our program. As a group, you have done very well in making observations, often under difficult and hazardous conditions and we want to say thank you in a more material and useful way than just a letter.

WIND CHILL

The capability to work or, in the extreme, to survive depends upon how well the human body is protected from the weather. Wind chill is the "apparent temperature" caused by the wind removing heat from the surface of exposed flesh. This is the temperature that a human would feel at the given wind and measured temperature. Figure 27 is the wind chill chart.

A person is not normally going to expose any bare skin in the colder conditions of this chart. The more practical application of wind chill data is to use it to estimate how much insulating material (clothing) is required.



NWS FORM TA 8-6-25 (6-76)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NOAA–NATIONAL WEATHER SERVICE WIND CHILL CHART

EQUIVALENT WIND CHILL TEMPERATURE °C

Wind speeds greater than 70 Km/Sec (35 Knots) have little additional chilling effect.

WIND SPEED Kilometers Per Hour	AIR TEMPERATURE °C													WIND SPEED Knots
70	-7	-14	-20	-27	-33	-40	-46	-52	-59	-65	-72	-78	-85	38
60	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-70	-77	-83	32
50	-6	-12	-18	-25	-31	-37	-43	-49	-56	-62	-68	-74	-80	27
40	-5	-11	-17	-23	-29	-35	-41	-47	-53	-59	-65	-71	-77	22
30	-3	-8	-14	-20	-25	-31	-37	-43	-48	-54	-60	-65	-71	16
20	0	-5	-10	-15	-21	-26	-31	-36	-42	-47	-52	-57	-63	11
10	5	0	-4	-8	-13	-17	-22	-26	-31	-35	-40	-44	-49	5
6	8	4	0	-4	-8	-12	-16	-20	-24	-28	-32	-36	-40	3
	8	4	0	-4	-8	-12	-16	-20	-24	-28	-32	-36	-40	

Figure 27.--Wind Chill Chart.

However, clothing quickly loses much of its insulating capability if it becomes wet either from external water sources (rain, spray) or internal (perspiration). This is because water will efficiently conduct body heat to the surface of the clothing where it is dissipated.

Tips to the Radio Officer

NORTH PACIFIC RADIOFACSIMILE SERVICES

Several changes have been made to Pacific area radiofacsimile broadcasts. The schedules listed below are now in effect and may be used to update Selected Worldwide Marine Weather Broadcasts, September 1982 edition.

NPM - Honolulu, HI (U.S. Navy, FFAX)

Frequencies (kHz) and times of use (GMT)

2122	(0600-1600)
4855	(0000-2400)
9396	(0000-2400)
14826	(0000-2400)
21837	(1700-0630)

Note: All frequencies are lower sideband except 2122 kHz.

Schedule

The NPM broadcast is virtually continuous. Daily schedules are broadcast at 0000 and 1200 GMT.

Comments concerning the quality and content of this broadcast may be addressed to:

Naval Western Oceanography Center
Box 113
Pearl Harbor, HI 96860

NMC - Point Rayes, CA (U.S. Coast Guard)

Frequencies (kHz)

4344.1, 8680.1, 12728.1, 17149.8

Schedule

TIME	AREA	CHART
0100Z		
0102	6	18Z TROPICAL WEATHER ANALYSIS
0112	5	18Z SURFACE WEATHER ANALYSIS
0122	5	24-HR SURFACE WEATHER FORECAST VALID 00Z
0132	5	24-HR SEA STATE FORECAST VALID 00Z
0300Z		
0302	3	12-HR SEA AND WEATHER FORECAST VALID 12Z
0312	4	12-HR SEA AND WEATHER FORECAST VALID 12Z
0400Z		
0402	5	72-HR EXTENDED SURFACE FORECAST
0412	5	00Z SURFACE WEATHER ANALYSIS
1500Z		
1502	3	SEA SURFACE TEMPERATURE ANALYSIS
1512	4	SEA SURFACE TEMPERATURE ANALYSIS
1522		EXPERIMENTAL
1532		EXPERIMENTAL
1700Z		
1702	6	12Z TROPICAL WEATHER ANALYSIS
1712	5	12Z SURFACE WEATHER ANALYSIS
1722	6	SATELLITE IMAGERY
2000Z		
2002		RADIOFACSIMILE SCHEDULE - NOTES
2012	5	12Z SURFACE WEATHER ANALYSIS
2022	5	500 MB STREAMLINE - MAX WIND VALID 00Z
2032	5	SATELLITE IMAGERY
2330Z		
2332	6	18Z TROPICAL WEATHER ANALYSIS
2342	5	18Z SURFACE WEATHER ANALYSIS
2352	5	24-HR SURFACE WEATHER FORECAST VALID 00Z
0002	5	24-HR SEA STATE FORECAST VALID 00Z

AREAS

3 = 40N-52N, EAST OF 135W
4 = 28N-40N, EAST OF 136W

5 = 30N-60N, EAST OF 160E
6 = 20S-30N, EAST OF 160W

Comments concerning the quality and content of this broadcast may be addressed to:

National Weather Service
Forecast Office
660 Price Avenue
Redwood City, CA 94063

NOJ - Kodiak, AK (U.S. Coast Guard)
Frequencies (kHz)
4298, 8459

Schedule

TIME PERIOD (GMT)	UNIT	TITLE
NUMBER 1		
0400-0450*	A.	12- AND 24-HOUR MARINE FORECAST TABLES
	B.	SEA SURFACE TEMPERATURE AND ICE ANALYSIS MAPS (1, 2, OR 3 MAPS SENT WEDNESDAY AND FRIDAY ONLY)
	C.	0000 GMT SURFACE WEATHER MAP
NUMBER 2		
1000-1030	A.	SURFACE PROGNOSTIC WEATHER MAP
	B.	0600 GMT SURFACE WEATHER MAP
	C.	FIVE-DAY MARINE WEATHER OUTLOOK NARRATIVE
NUMBER 3		
1800-1830*	A.	12- AND 24-HOUR MARINE FORECAST TABLES
	B.	FIVE-DAY MARINE WEATHER OUTLOOK NARRATIVE (REPEAT OF (C) IN TIME PERIOD ABOVE)
	C.	1200GMT SURFACE WEATHER MAP
NUMBER 4		
2200-2250	A.	SURFACE PROGNOSTIC WEATHER MAP
	B.	1800 GMT SURFACE WEATHER MAP
	C.	SEA ICE FORECAST MAP
	C.	SIGNIFICANT WAVE HEIGHT PROGNOSTIC MAP

*TRANSMISSION TIME CHANGES TO 1900-1930 GMT AND 0500-0550 GMT DURING STANDARD TIME.

NOTE: EACH UNIT TAKES APPROXIMATELY 10 MIN IN THE TIME PERIOD. MAPS MAY NOT ALWAYS BE SENT IN THE SEQUENCE SHOWN. IF A UNIT IS NOT AVAILABLE AT TRANSMISSION TIME, A NOTE WILL BE TRANSMITTED TO THAT EFFECT, E.G. "4A SURFACE PROG. NOT AVAIL."

Comments concerning the quality and content of this broadcast may be addressed to:

National Weather Service Office
Box 37
Kodiak, AK 99619

SSB WEATHER REPORTS

Some nighttime and coastal ship observations in the ship synoptic code by SSB are helping to fill some of the holes on the weather map. These additional observations should improve the morning forecast and are greatly appreciated.

TIMELY REPORTS

Based upon a survey of the "Weather Report for Immediate Radio Transmission," NOAA Form 72-4A that you have sent us, we have made the following graph (fig. 28):

The zero line, right above the word "after," is the synoptic time of the observation. The peak occurs at 5 min before the hour with 18

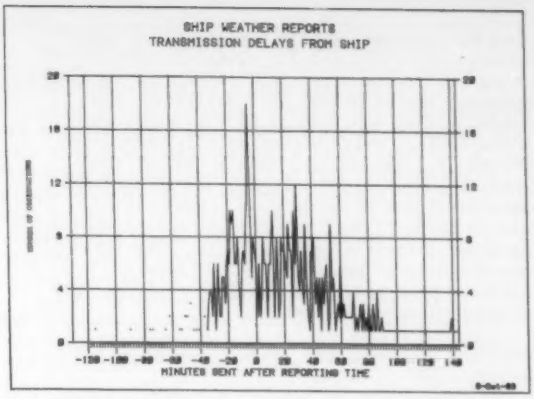


Figure 28.-- Distribution of a small sample of observations about the synoptic hour.

observations, which is great. Most of the observations were transmitted between 30 min before and 60 min after the hour. If the Coast Guard enters the observations into the system expeditiously, and they assure me they are, the forecaster should get all of these obeervations on his weather map.

I don't understand the transmissions prior to 30 min before the hour. The time of observations is the time the barometer is read to the nearest hour. Therefore, the barometer could be read from 30 min before to 29 min after the synoptic hour, preferrably exactly on the hour. The message could be delayed aboard ship, but I know of no way to advance the time of the observation prior to 30 min before the synoptic observation. These should have been listed at the correct hour of observation.

CALL SIGN OMISSIONS

The call sign must be the first group of the normal weather report. STORM and SPREP, when used, preceed the call sign. NWS computers only accept data in the correct format. We have recently found that some weather reports are being received without the call sign. The computers that now handle all our incoming data are not programmed to make exceptions and the incorrectly formatted observations are not used in these programs. Please be sure your ships observations are correctly formatted. We need every observation we can get.

The Editor's Desk

NOAA OPENS OCEAN SERVICE CENTER

The National Oceanic and Atmospheric Administration (NOAA) has opened its NOAA Northwest Ocean Service Center in Seattle, Wash., to serve the varied marine community along the west coast. The Center serves the region with a complement of NOAA products and services, emphasizing 60,000 square miles of the Pacific Northwest coastal and offshore area. NOAA elements represented at the Center include: the National Ocean Service, the National Marine Fisheries Service, the National Weather Service, the Office of Oceanic and Atmospheric Research, and the National Environmental Satellite, Data, and Information Service.

The Center provides a variety of services which are important to the public and the economy of the region. These services include marine atmospheric and oceanographic warning forecasts and analysis; information on nautical charting, tide and tidal current predictions and related publications; retrospective oceanic data and information; marine advisory services, extension educational, training, and technology

transfer programs; marine environmental quality services and ocean service research information; living marine resource exploitation and management programs; environmental data collection and dissemination; and tsunami warning services.

The center, which was officially dedicated October 27, 1983, by Dr. John V. Byrne, NOAA Administrator, offers tailored and pre-packaged operational and archival data. Operational data includes 24-hour atmospheric and oceanographic analyses, forecasts, and warnings. The archival data includes access to technical reports, inventory searches, data management advice, and regional climate information.

TOUGHENED BY COLD, DAMP, WIND? YOU'RE IN NEW WEATHER INDEX

The measurement of weather discomfort known as the wind-chill factor has been refined into a new register of misery -- the weather stress index.

Developed by NOAA and the University of Delaware, it adds humidity to temperature and wind speed figures used to calculate wind chill. Then, using statistically normal conditions as a benchmark, it measures the amount of change from normal to provide a weather stress index or "apparent" temperature.

The weather stress index thus estimates human reaction to weather conditions. It assumes that reactions depend upon variations from "normal" conditions, and that if people are reasonably adjusted to the weather at their locale, the weather is normal.

The discomfort criteria for, say, New Orleans, La., and Bismarck, N.D., differ drastically, but each is designed to estimate the discomfort being experienced by the person on the spot.

For example, a temperature of 15°F with a relative humidity of 80 percent and wind speed of 15 mph at New Orleans on a winter day would represent a highly stressful condition, and residents would suffer, while a similar condition in Bismarck would be commonplace.

Using the new index, analysts at NOAA have determined that resident east of the Rockies experienced the most uncomfortable days of the century on Jan. 10-11, 1982. On Jan. 10, Norfolk, Neb., had a temperature of -23°F but an apparent temperature of -58°F. The next day Philadelphia's temperature of -3°F and Atlanta's -4°F converted to apparent temperatures of -14°F and 20°F, respectively.

The index will be used to generate daily, weekly, and monthly weather-stress maps of the United States, which are expected to have utility for industry, recreation, transportation, medicine, and agricultural planners.

NTSB CITES A SHATTERED PORTHOLE ELECTRICAL MALFUNCTION, LOSS OF CONTROL IN OCEAN RANGER SINKING

Seawater that entered through a shattered porthole and splashed into a ballast control console, causing an electrical malfunction, resulted in loss of control of ballasting that capsized and sank the mobil oil drilling rig OCEAN RANGER, the National Transportation Safety Board reported on February 8, 1983.

All 84 OCEAN RANGER crewmembers perished in a raging North Atlantic storm last February 15.

The Board found that the crew was unable to effectively operate the drilling rig's ballast control system manually after the electrical malfunction. The result was filling of forward ballast tanks and a 10° to 15° list or tilt of the 284-ft-high rig. This led to flooding of anchor chain lockers in its forward support columns by waves as high as 50 ft.

Contributing to the accident, the Board held, were the failure of the rig's owner/operator "to provide sufficient training" to its crew in operation of the ballasting system, and the failure of the porthole glass for undetermined reasons.

Contributing to the loss of the entire crew, the Board found, were (1) the lack of exposure suits for crewmembers that could have prolonged life in the 31-degree water; (2) the difficulty of launching lifeboats and liferafts in the severe wind and sea conditions; and (3) the "inadequate equipment" aboard the rescue vessels for recovering survivors from the sea.

The OCEAN RANGER was anchored in about 260 ft of water on the Grand Banks 166 mi east of St. John's, Newfoundland. It was a 408-ft-long semisubmersible drilling rig -- a platform on eight supporting columns that floats with the buoyancy provided by two large underwater hulls -- it then was the world's largest semisubmersible rig.

Evidence gathered in a joint investigation by the Safety Board and the U.S. Coast Guard, together with a Canadian government diving expedition that inspected the sunken rig, showed no structural failure or major damage. Three-eight-inch thick glass had been smashed out of two portholes in the ballast control room. Divers found manual control rods inserted in the control system. The indicated efforts to manually control ballast valves that normally were operated electrically.

From physical evidence and from reports of conditions on the OCEAN RANGER in radio transmissions made before it capsized, the Safety Board concluded that the rig had developed a 10° to 15° list toward its port bow as "a combination of a ballast control panel malfunction, operational error, and the design limitation of the OCEAN RANGER ballast pumps that could not pump out the forward lower hull ballast tanks if the rig was listing more than 11°. There was no evidence that any of the rig's crew had ever operated its ballast controls manually.

The storm had begun on February 14, worsened rapidly, and produced winds as high as 90 kn. The OCEAN RANGER broadcast its first distress call at 12:52 a.m. February 15, reporting a severe list.

The rig's standby vessel SEAFORTH HIGHLANDER reached the scene at 1:50 a.m. After sighting the OCEAN RANGER, it found an occupied lifeboat with a hole in its bow. In the attempted rescue that followed, the lifeboat overturned alongside the SEAFORTH HIGHLANDER, throwing as many as six men into the sea and apparently drowning others inside the covered, 50-man craft. Lifelines were thrown to life-jacketed crewmen

in the water, but none could hold on.

The SEAFORTH HIGHLANDER and other rescue vessels were able to recover the bodies of only 22 crewmembers, all of whom were found to have died from exposure to the 31-degree water and 24-degree air temperatures. The damaged lifeboat that had turned over alongside the SEAFORTH HIGHLANDER was sighted again, but never recovered. Another 50-man lifeboat was recovered; damage indicated it had been launched prematurely with no one on board.

The Safety Board said the OCEAN RANGER sinking, and the capsizing of the ALEXANDER L. KIELLAND and the loss of 212 lives in the North Sea in March 1980, show "the difficulty involved in abandoning semisubmersible drilling units and similar structures under severe sea conditions" using conventional methods of lowering lifeboats into the sea. Norway and several other countries, the Board said, have developed a free-fall launching system to make disabling launch damage to lifeboats less likely.

The Board also noted that the SEAFORTH HIGHLANDER was not adequately equipped to recover persons from stormy seas, and that rescue baskets have been developed that can be held clear of the rescue vessel's sides and involve "little or no participation by those being rescued."

Edited from Volume 2, No. 2 of the NTSB NEWS DIGEST, February 8, 1983

The Safety Board's complete printed report is now available. Copies of this report, which should be identified as PB-83916402 may be purchased by mail from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

AUTOMATING NOAA's SHIPWRECK FILE

The following article by Jack Stringer is reprinted from NOAA Magazine.

Few can deny that the discovery of an underwater wreck is the ultimate goal of the intrepid diver. For many divers, however, this search is seldom consummated because information concerning the location of the shipwreck has been neither readily available nor accessible--that is, until the advent of the computer.

Only about 200 of the Nation's marine surveyors, researchers, salvagers, and scuba divers know of AWOIS, the new (and what may be the ultimate) source of shipwreck information.

Developed by NOAA's National Ocean Service, AWOIS is the acronym for Automated Wreck and Obstruction Information System. It's a computer-based file currently containing 3,100 specific records which have been or may be considered for investigation by the National Ocean Service for its charting responsibilities.

"The system is, in fact, a modification of a procedure that has been in existence for years," said Dennis J. Hill, who began to develop the new system only 2 yr ago.

"The difference between this new method and what we've been doing in the past," he said, "is that we're now using the computer to file all our historical items, which makes them available whenever we develop a hydrographic survey plan."

The computerization of the cartographic source of navigational hazards, such as wrecks, shoals, and piling, also has resulted in significant cost savings. "With such comprehensive descriptive information on navigation hazards," said Hill," our hydrographers often complete an investigation successfully without conducting expensive searches with echo sounders, side-scan sonar, or by wire drag, a system that requires two ships steaming along parallel courses towing a submerged cable that snags on potential hazards to navigation.

The information that Hill seeks for the AWOIS is obtained from NOAA's Office of Charting and Geodetic Services and includes hydrographic and topographic surveys, chart files, Coast Pilot and archival records. Additional entries come from Power Squadrons, Coast Guard Auxiliary chart correction programs, and from other Federal agencies such as the Coast Guard, Corps of Engineers, Navy and Army, and private citizens.

"There is a significant amount of copyrighted material in the file," Hill said. When the system is completed, it will contain an estimated 20,000 entries. Since new information requires intensive research, the AWOIS file is not expected to be completed before the year 2000.

In the meantime, the system grows. Although incomplete, records are now available for all U.S. waters, including Hawaii, Alaska, the great Lakes, and the waters of the U.S. Trust Territories.

Hill says that the largest amount of data in the computer are weighted toward the upper east coast of the United States. "The reason for this emphasis," he said, "is that our present practice is to research those areas active in NOAA hydrographic projects."

In recent years, the sea lanes of the Delaware and Chesapeake bays have been a prime area for investigation by the two NOAA ships, the RUDE and HECK. It was on such a project in the Delaware Bay that an unknown 19th-century ship, possibly a British cargo vessel, was discovered between Lewes, Del., and Cape May, N.J.

The commanding officer of the two wire drag vessels said in his report that the wreck lay in 39 ft of water, about 15 mi from Lewes, 7-1/2 mi south of Cape May and 12 mi east-northeast of Cape Henlopen, Del.

NOAA scuba divers found nothing remaining of the wreck's superstructure. The ship's cargo, however, laid open on the bottom, and consisted of thousands of pieces of neatly packed British-made chinaware. The Coast Guard was notified of the wreck's location, which now appears on NOAA's nautical charts as a wreck symbol.

At the mouth of the Choptank River in the Chesapeake Bay, the RUDE and HECK were investigating a charted sunken wreck when the ship's sonar recorded another "substantial obstruction" nearby. Identified only as a deteriorated wreck with a small metal house on the after portion, the ship was located at a depth of 41 ft. Divers investigated and found the wreck was a wooden vessel, close to 100 ft long and about 18 ft wide. Its cargo, hundreds of milk-glass molassas pitchers, lay buried in the ship's silt-filled hold. This wreck was

later identified as the Old Bay Line steam packet, NEW JERSEY, lost in the Chesapeake in 1870.

The RUDE and HECK are the only vessels of their kind in operation in U.S. waters. The twocraft, working together, locate underwater obstructions by towing a wire between them suspended from surface buoys. When the wire catches on an obstruction, it becomes taut, forming a "V." Last fall, the two ships dragged a 1-mi-wide strip north of Long Island, N.Y. Recently, they worked in the Gulf of Mexico seeking any object which may be hazardous to shipping.

Requests for AWOIS information come from all over the United States, Canada, and Europe. Inquiries should provide information within specific areas, preferably using latitude and longitude to define their limits.

The public does not get any copyrighted materials, instead, the title and publisher of the relevant document are sent. In many instances, copyrighted material is the only source of information for AWOIS records. This is used to supplement other nautical charting sources as well as to indicate the presence of uncharted wrecks requiring NOAA field investigations.

AWOIS data, filed on magnetic tape, is immediately accessible, making known the status of every item in the system and the type of investigation required. A recent improvement in the system allows it to produce a graphic output which consists of an overlay depicting wreck obstruction symbols that can be placed over any existing chart.

Standard fees for AWOIS data generally range from $10 to $20, but can exceed $50. The fee also entitles requesters to users' guides that contain a 180-item wreck bibliography. Assistance will also be provided if a user has difficulty in interpreting any of the AWOIS data.

Further information on the AWOIS program can be obtained from the Hydrographic Surveys Branch, National Ocean Service, NOAA, Rockville, MD 20852.

ANCHOR OF USS MONITOR RECOVERED

The anchor of the USS MONITOR was recovered by the National Oceanic and Atmospheric Administration (NOAA) on August 29, 1983.

The Commerce Department agency said the anchor was raised to the deck of the Research Vessel JOHNSON, operated by the Harbor Branch Foundation, Ft. Pierce, Fla., from a spot 230 ft deep and 16 mi southeast of Cape Hatteras.

The anchor is in good condition, highly encrusted with coral, sand, and shells. Six ft of chain came aboard with it.

It was raised with a 2000-pd air bag. The bag was filled with air from the submersible JOHNSON SEA-LINK at 9:47, and broke the surface at 9:52 a.m.

The 1300-pd, four-pronged anchor will remain aboard the RV JOHNSON, wrapped in wet cloth, until it is turned over to East Carolina University at Beaufort on September 1. The university will transport it to the Greenville, N.C. campus for preservation.

The USS MONITOR engaged the Confederate ironclad CSS VIRGINIA on March 9, 1862, at Hampton Roads, Va., the most celebrated battle in American naval history. Its career was cut short when the "cheesebox-on-a-raft" was lost at sea on Dec. 31, 1862. The wreck of the Monitor was found in 1973.

To ensure that the Monitor would be preserved for systematic scientific investigation and development as a resource of national significance, the wreck was designated as the United States' first national marine sanctuary by the Commerce Department on Jan. 30, 1975.

NOAA, NASA STUDY OF GLOBAL CLOUDINESS

"Who is wise enough to number all the clouds?" (Job 38.37)

An international scientific group is going to try.

A 5-yr Internation Satellite Cloud Climatology Project has been launched to produce a detailed description of global cloudiness, the Commerce Department's National Oceanic and Atmospheric Administration (NOAA) announced today. NOAA and the National Aeronautics and Space Administration (NASA) are lead agencies for U.S. participation.

The project is aimed at trying to find out how global cloudiness affects weather and climate, to help improve worldwide weather forecasting. It is known that clouds cool the Earth by reflecting incoming solar radiation, and also warm the Earth by trapping outgoing Earth radiation, but the net effect is largely unknown.

The project will seek answers to such questions as--

--If the Earth's climate gets warmer, will the amound of clouds increase or decrease?

--If the amount of clouds change, will the Earth become warmer, or cooler?

--Do clouds stabilize, or destabilize, climate?

Major participants in the study are the United States, Canada, the European community, Japan, and India. The project will collect digital data from a global array of five overlapping geostationery satellites plus a polar-orbiting satellite in assembling its climatological information. By the end of this year all six are expected to be operational, for the first time since 1979.

The satellites are GOES-West, GOES-East, and TIROS-N of the United States, Meteosat of the European Space Agency, Insat of India, and GMS of Japan.

The interagency National Climate Program Office is working with representatives of NASA, NOAA, the National Science Foundation, and the Departments of Energy and Defense to coordinate U.S. participation in the program. The project is part of the World Climate Research Program jointly sponsored by the World Meteorological Organization and the International Council of Scientific Unions.

MARINE WEATHER REVIEW

The Weather Logs combined with the cyclone tracks, U.S. Ocean Buoy climatological data, gale and wave tables, and mean pressure patterns are a definitive report on the weather systems and primary storms which affected the North Atlantic and North Pacific Oceans during this 3-mo period. Hurricane Alley lists and describes tropical cyclones worldwide. Unless stated otherwise, all winds are sustained winds and not gusts; all times are G.M.T.

North Atlantic Weather Log

April, May and June 1983

WEATHER LOG, APRIL 1983--There were vast differences between the storm tracks and the mean sea-level pressure and their climatic counterparts. The central ocean between 45°and 60°N was a vast waste land for storm tracks. This was reflected in the mean sea-level pressure pattern where high pressure replaced the Icelandic Low. Storm tracks over the interior United States tracked northeastward over Quebec. Storms along the U.S. East Coast generally tracked northeastward and dissipated over the Maritime Provinces. A few tracked eastward and dissipated against the high pressure. One during the second week managed to complete the journey along latitude 40°N to Europe.

A series of LOWs formed east of Bermuda during the middle of the month and moved northward then eastward to die out. There were a few LOWs north of latitude 60°N that traveled in various directions. Many LOWs meandered over Europe, particularly those countries bordering the North Sea.

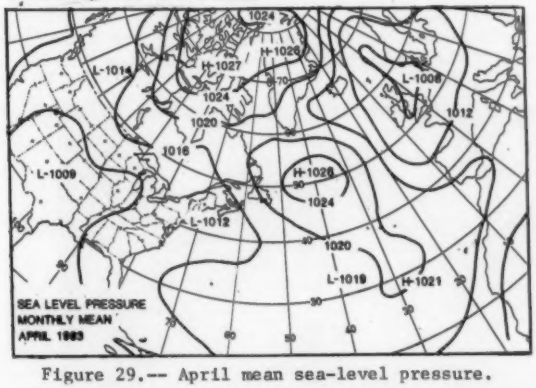


Figure 29.-- April mean sea-level pressure.

The monthly mean sea-level pressure pattern had little relation to the climatic mean (fig. 29). The 1008 mb climatic Icelandic Low near 60°N, 35°W was replaced by high pressure and instead there were two 1008 mb centers over the North Sea and Norwegian Sea. High pressure was centered along approximately 40°W from the North Pole to 20°N. A normal 1021 mb Azores High was near 30°N, 28°W. To the north there was a 1026 mb center near 50°N, 40°W, and another over northern Greenland. There was an incipient 1012 mb LOW over Cape Cod and another of 1019 mb near 32°N, 40°W.

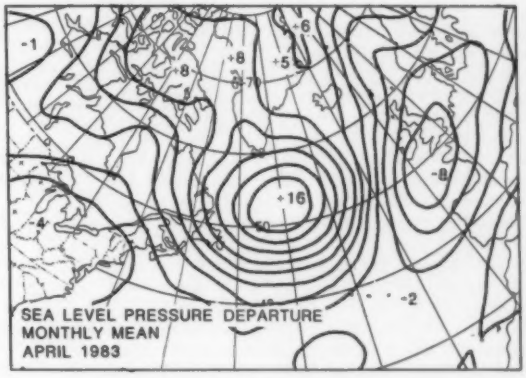


Figure 30.-- April mean sea-level pressure departure.

The main feature of the sea-level departure pattern was a plus 16 mb anomaly center near 50°N, 40°W (fig. 30). There was a minus 8 mb center southeast of the Brest Peninsula, and a minus 4 mb center near Louisville, Kentucky.

The 700 mb upper air pattern featured a sharp ridge along 40°N. There was a anomalous 2,916 m LOW over James Bay with the long-wave trough shifted to the U.S. Midwest. There was also an anomalous 2,854 m LOW east of Iceland with a sharp trough across England and then along the coast of Portugal. Normally from the U.S. East Coast to central Europe there is primarily zonal flow.

Some Climatology. On the 2d in 1975 the northeastern U.S. was in the grip of a severe storm with hurricane-force winds along the coast and 2- to 3-ft of snow in New Hampshire and Maine. On the 13th in 1877 a second coastal storm in 3 days struck Virginia and the Carolinas. The first storm flattened sand dunes at Hatteras and windened Oregon Inlet 3/4 mi. More erosion occurred along the coast due to hurricane-force winds. On April 16, 1851 a storm raged near Boston and destroyed Minot Light with two keepers inside. There were large shipping losses and erosion. On the 29th in 1928 a late storm dumped up to 35 in of snow on West

Virginia, and 30 in on Maryland, and Pennsylvania. High winds and heavy wet snow destroyed many trees and unroofed homes.

Extratropical Cyclones--The first of the month HIGHs dominated the North Atlantic. By midweek LOWs were intruding and the last of the week LOWs were the predominate with two large circulations. The LOWs weakened the second week with generally all weak circulations. A large HIGH was moving out of Newfoundland with a LOW over Kap Farvel. By the end of the second week the 1034 mb HIGH had moved along 50°N to Europe. There were LOWs over the Denmark Strait and near 30°N, 35°W.

The third week a 1038 mb HIGH was stationary near 47°N, 40°W. High pressure covered Europe and the Mediterranean. LOWs developed over Europe as those HIGHs moved southeastward. At the end of the week the HIGH over the ocean split into two north-south centers. There were weak LOWs over eastern Canada and Europe.

The first of the fourth week there was a large area of flat gradient off the U.S. East Coast. The HIGHs still persisted over the central ocean. A large quasistationary LOW persisted off the Brest Peninsula from the 21st to the 28th.

The last day of March a low pressure center moved across northern Florida and developed over the Gulf Stream. By 0000 on April 1 the ALLTRANS EXPRESS (36°N, 71°W) was measuring 55 kn southeasterly winds. Several other ships including the AMERICAN TRADER had gales near 45 kn. At 1800 the MAURICIO DE OLIVEIRA (38°N, 65°W) had 40-kn winds and 33-ft seas. The NNBN (40°N, 70°W) measured 48-kn northerly winds and 20-ft waves. At 1200 on the 2d the LOW was 982 mb near 42°N, 63°W (fig. 31). The MAURICIO DE OLIVEIRA, still near 38°N, 65°W, now had 63-kn winds with continuing 33-ft seas. The ACADIA (41°N, 67°W) found 50-kn northerly winds and 25-ft waves. On the 3d the storm was traveling eastward and had filled to 1002 mb at 1200. The ROKKOHSAN MARU (37°N, 61°W) had westerly 45-kn winds, 20-ft seas, and 26-ft swells. The NORDPOL (35°N, 54°W) measured 50-kn winds. On the 4th the WHITE CHESTNUT (38°N, 32°W) was nearer the HIGH than the LOW and had 43-kn southeasterly winds. The LOW turned northward on the 5th and dissipated.

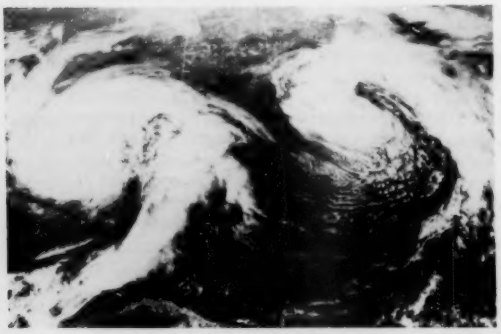


Figure 31.-- Two large storms in trail. This storm is off Cape Cod. The next described storm is over the Ohio River valley. NOAA SMS 1.

This LOW formed at the point of occlusion of a front that was sweeping up the U.S. East Coast. At 0000 of the 4th the LOW was over Long Island. The storm traveled eastward slowly and at 1200 on the 6th was 996 mb near 40°N, 49°W. The WHITE CHESTNUT was now near 36°N, 45°W, just west of the cold front, with 54-kn measured southwesterly winds but the waves were reported as only 8 ft. SEDCO 706 (46°N, 47°W) had 42-kn easterly winds and 12-ft waves. On the 7th there were some gales but the ONDINA (41°N, 59°W) measured 66-kn winds at 0600, up from 54 kn at 0000. No waves were reported. The higher winds were north and west of the center of the storm.

On the 7th a second center formed west of the original and on the 8th another east of the original center. The JALAPA (38°N, 40°W) found 30-kn northeasterly winds with 8-ft seas, but the swell waves read 41 ft. By the 9th the original LOW had disappeared, and the new eastern center became the primary LOW.

Monster of the Month--This storm formed from the new eastern LOW mentioned above. It added to the misery of northern France, Germany, and the Low Countries. The front on which this storm developed had been lying more or less east-west across that area of Europe for many days bringing rain and flooding. This storm added to the already soaked ground and high water.

At 1200 on the 8th the LOW was 994-mb at 41°N, 27°W and moving northeastward toward the English channel. Gales were blowing over the Bay of Biscay on the 9th but the FINNEAGLE (44°N, 09°W) measured 58-kn southwesterly winds and 17-ft waves. At 1200 on the 10th the LOW was 993 mb near 15°N, 05°W (fig. 32). The GHJY (48°N, 09°W) measured 60-kn southeast winds and 20-ft waves.

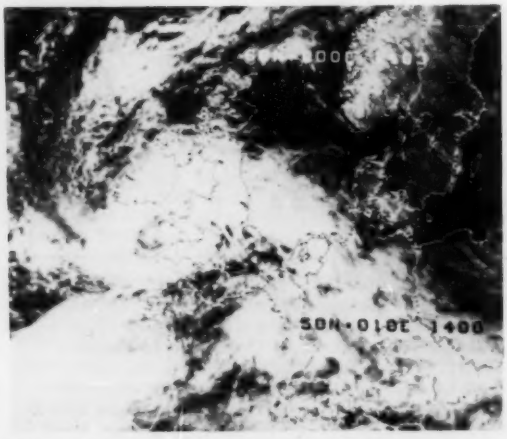


Figure 32.-- The storm does not appear well-organized here but it contained some vicious winds and heavy rains. NOAA 7.

The drilling vessel JARAMAC 57 had an engine breakdown in very heavy seas 22 mi north-northeast of Ushant. The Yacht BRENDA had rudder problems and was taking on water in the English Channel. The fish factory SCHUTTING 1 took on water and sank in the English Channel. All the crew were rescued. The GEORGIOS VASOILIS was abandoned by the crew which was rescued. The vessel was later found and towed to Jersey. The Salcombe lifeboat THE BALTIC EXCHANGE capsized off Devon in force 11 winds while trying to save a group of skin-divers. The JUBILENCE reported no steering in the eastern English Channel in force 8 winds and a rough sea. The BAYCLUB had an engine room fire in heavy weather and had to call for a tug. One crewmember was missing. A total of 53 seamen were rescued during this storm.

As the storm moved over Germany on the 11th it weakened but still was bringing more rain. By the 13th it was over the USSR.

Heavy rains caused flooding through northern France and Germany. Floods along many rivers caused thousands of people to be evacuated from homes and even hotels and one zoo. In Paris all roads on the banks of the Seine were closed as it rose more than 16-ft above normal. Traffic on the Rhine River was halted as the river rose to more than twice its normal level. Some of the major cities along the Rhine suffered major flood damage and basements had to be pumped. Many wine cellars were flooded.

The Ohio River valley produced this storm as a frontal wave on the 7th. It moved across the Great Lakes and then along the north side of the St. Lawrence River valley. At 1200 on the 9th the storm was 998 mb near Notre Dame Bay. There were some gales, especially in the northerly flow, as the storm moved towards Kap Farvel, blocked by high pressure south of Iceland. CHARLIE had 20-ft swells as the cold front passed at 0000 on the 11th, at 1200 they were 23 ft. The cold front stretched southward approximately along longitude 35°W. There were large HIGHs on both sides with a relatively tight gradient. The wind shift in many places was 180°.

A ship near 40°N, 43°W had 45-kn northerly winds with 20-ft swells. The GEORGE OUSHAKOU (51°N, 40°W) had 26-ft swells. The 982-mb storm was at 65°N, 35°W at 1200 on the 12th.

On the 13th at 0000 the MARCHAL EREMINKO near 61°N, 30°W had 50-kn winds and 26-ft seas. The storm now turned a counterclockwise loop over the Denmark Strait as a new center formed over Iceland and moved eastward. There were some gales reported by fishing vessels on the 13th and 14th. The STUDLAFOSS (57°N, 37°W) reported 52-kn winds on the 15th. LIMA measured 40 kn. The storm moved into Norway on the 17th.

This LOW formed near Cape Hatteras on the 10th. By 1200 on the 11th it was near Cape Cod. The IMPERIAL QUEBEC (44°N, 64°W) had 53-kn easterly winds. The SAN PEDRO (40°N, 70°W) measured 49-kn southwesterly winds. At 1200 on the 12th the 998-mb storm was over Prince Edward Island. There were gales up to about 40 kn over the open water. High pressure east of the center defeated the storm on the 13th.

This LOW formed over the Denmark Strait, often an area of cyclogenesis, late on the 18th. High pressure stretched southward from Kap Farvel and there was an overlying upper-air ridge. The southerly flow on the east side of the ridge guided the LOW south-southeasterly. There already was a surface and upper-air LOW off Cape Finisterre. On the 20th this surface LOW and part of the upper-air LOW broke off and started moving northward as the Denmark Strait LOW moved southward. The GULFSTRIM (59°N, 24°W) measured 47-kn wonds from the north with 26-ft seas. At 1800 the KIELDRECHT (47°N, 25°W) had 42-kn northwesterly winds, 13-ft seas, and 33-ft swells. The two LOWs passed within about 500 mi of each other about 1800 on the 20th heading in opposite directions. On the 21st there were many gale- and storm-force wind reports with sea and swell reports up to 33 ft. The USNS COMET (44°N, 22°W) reported 50-kn winds and 28-ft swells. These were occurring in both the northerly and southerly flow (fig. 33).

Figure 33.-- This is not a conventional looking storm with little cloud cover near the center. The storm that moved northward is east of Iceland. NOAA 7.

When the 988-mb LOW got as far south as latitude 48°N on the 22d it started looping northward through the east. There were some storm-force wind reports but fewer than on the 21st. The ATREUS had deck cargo shift on the 21st and heavy weather damage into the 22d. She took refuge in Santa Marta Bay on the

northwest coast of Spain. The MILHAFRE radioed a distress message at 0559 on the 22d that containers had shifted in heavy weather near 38°N, 18°W. She developed a list of 55° in hurricane gusts and seas of 15 to 20 ft. All eight crewmen abandoned ship in a liferaft. The URSULA picked up seven survivors and one body. The MILHAFRE sank. There were fewer yet high wind and wave reports on the 23d as the storm turned westward over Ireland and then southward. The storm was stationary on the 24th, 25th and 26th near 52°N, 10°W (fig. 34).

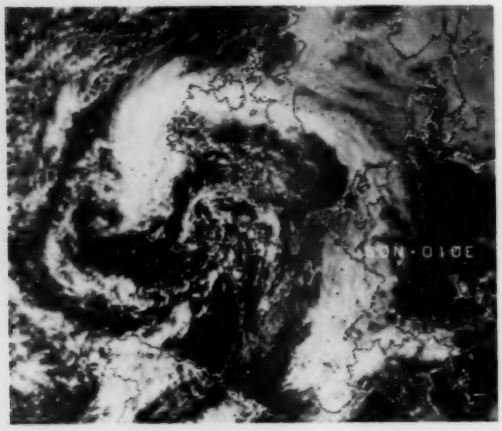


Figure 34.-- the still open center storm is centered over Cork, Ireland, with high winds to the west and south. NOAA 7.

The ONOBA (47°N, 11°W) was very near the center and measured 68-kn winds. No seas were reported to compare them with the wind speed. The AVON FOREST (51°N, 19°W) measured 60-kn winds and 26-ft waves. The USNS AMERICAN EXPLORER (41°N, 19°W) had 20-ft waves. The storm was weakening and drifting southeastward on the 27th and again became stationary near 48°N, 05°W for 48 hr when it dissipated.

The U.S. Gulf Coast produced this storm. It formed east of New Orleans on the 23d. By 1200 on the 24th it was 988 mb west of Norfolk, Virginia. There were gale- to storm-force winds in the southerly flow off the east coast. The ROSINA TOPIC (37°N, 69°W) measured 55-kn winds from the southeast and 17-ft seas while the PANAMA (33°N, 71°W) had 40-kn winds, also from the southeast, 17-ft seas, and 30-ft swells. At 0000 on the 25th the PORT VANCOUVER (38°N, 70°W) measured 60-kn winds from the south, 17-ft seas and 38-ft swells. Twenty-four hours later her winds were only 35 kn but 13-ft seas and 33-ft swells persisted. Buoy 44004 measured 20-ft seas. By 1200 on the 26th the 997-mb storm was over Maine with a weakened gradient. The storm dissipated late on the 27th over Nova Scotia.

Casualties--Fog was bad several times over the European area of the ocean. On the 9th the PROTEUS and SCANDINAVIA MARU collided in fig in Flushing Roads. On the 23d the MARTHA RUSS and the M. ENGIN collided in fog on the Kiel Canal. The same day the RAPLO and PATRICIO MURPHY collided in fog in the Kiel Canal. On the 30th the ISBERG and TILLA collided in fog near 54°N, 02°E. The ISBERG sank and the TILLA rescued the five crewmembers.

The ZAANDAM suffered damage in Catalina Harbour when she backed into ice.

The following ships suffered heavy weather damage this month: EASTERN WISEMAN, HERCULUS, LONTUE, MISS NATHALIE, MONTAUK OSPREY, OCTONIA SUN, POLAR MARIE, SAN PEDRO, SIGLO, TARPON SENTINEL, and WESTERN GULF.

WEATHER LOG, MAY 1983--There was no concentration of storm tracks that could be considered a primary track this month. Their direction of travel varied from north to east to south. Several storms traveled southward off the Irish coast then turned northward over England.

On the monthly mean sea-level pressure chart the primary LOW was 1005 mb over the northwest coast of Ireland (fig. 35). This was many miles from the climatological Icelandic Low near 60°N, 35°W. The Azores High was 1026 mb near 35°N, 42°W, 4 mb higher and about 400 mi northwest of its climatic position.

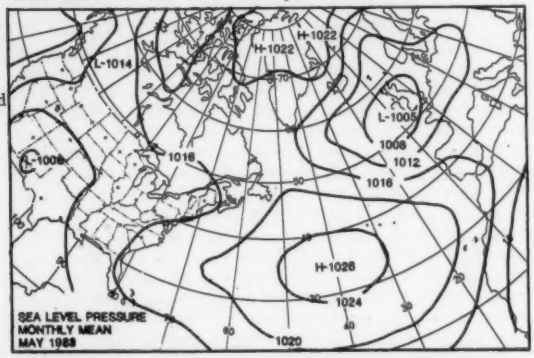


Figure 35.-- May mean sea-level pressure.

There were two major anomaly centers. A minus 10 mb near Cork, Ireland and a plus 6 mb east of Hamilton Inlet, Labrador. Most of the ocean had higher than normal pressure north of latitude 20°N except the northeast part. The zero isoline roughly stretched from Lisbon to 40°N, 25°W to 60°N, 30°W to Nordkapp, Norway with the enclosed area below normal pressure.

In the upper air at 700 mb there was a trough west of the Appalachian Mountains that is normally off the East Coast. There was a LOW over the northwest tip of Ireland with a trough paralleling longitude 10°W. The ridge over the central ocean was more pronounced than normal with an anomalous HIGH over the Denmark Strait.

Some Climatology--On the 18th in 1894 a violent storm struck Lake Michigan and sank nine ships. May 19, 1780 was the famous Dark Day in New England. It was almost as dark as night at noon, the result of forest fires west of New England.

Extratropical Cyclones--The month started out with a large HIGH between Bermuda and the Azores. LOWs moved across the northern latitudes. At the end of the first week there was a LOW west of Gibraltar. During the second week the HIGH persisted in midocean centered in the vicinity of 40°N, 40°W. Another high pressure cell was centered over Labrador. A large LOW moved to near the west coast of Ireland and persisted until the end of the second week.

During the third week the HIGH broke down and drifted south. Another LOW moved over Ireland. The last half of the week a ridge built from Iceland to the Azores a large HIGH moved eastward from the U.S. East Coast.

The fourth week the ridge broke down but left high pressure centered between 40° and 45°N that stretched from the United States to Europe. Weak LOWs were moving across the top of the HIGH. By midweek the HIGH was centered west of Spain. The LOWs now strengthened slightly but at the end of the month all pressure systems were generally weak.

This LOW moved across the eastern Great Lakes and on May 2 was off Hamilton Inlet at 994 mb. Ships around Newfoundland were reporting gales and fog. The VCRZ (46°N, 56°W) measured 61-kn southwesterly winds with one quarter mile visibility. Blue Hill Observatory, Mass. measured winds of 45 mi/hr. The storm was traveling in a southeasterly direction on the 3d. The FEDERAL OTTAWA (45°N, 40°W) measured 43-kn northwesterly winds and 23-ft seas. The TRANSCOLUMBIA (42°N, 36°W) had 50-kn westerly winds and 20-ft seas. By 1200 on the 4th the 990-mb storm was near 48°N, 22°W. The AMERICAN ACCORD (47°N, 29°W) had only 25-kn winds but the swell waves were 20 ft. On the 5th the storm was traveling northeastward. The VHZE found 28-ft waves in the northerly flow west of the center on the 6th. The storm weakened as it moved over the continent.

Monster of the Month--This storm was the result of two systems combining and intensifying. One LOW developed between Kap Farvel and Iceland and moved eastward. The other formed east of Cape Cod and moved northeastward. They combined into one center late on the 8th. CHARLIE had 31-kn winds with 20-ft seas at 1800. At 1200 on the 8th one LOW was 990 mb, the other 984 mb. On the 0000 chart of the 9th the LOW was 976 mb near 61°N, 22°W (fig. 36). CHARLIE now had 40-kn winds and 21-ft seas. Several ships had gales and 20-ft seas. The FEDERAL MAAS (53°N, 32°W) had 48-kn winds and 26-ft seas.

By 1200 on the 10th the storm was 966 mb near 55°N, 10°W, ROMEO had 35-kn winds and 33-ft seas just east of the front. Gales and 20-ft seas were not uncommon. The AMERICAN ACE (49°N, 08°W) had 35-kn westerly winds, 17-ft seas, and 28-ft swells. The LOW was quasi-stationary near 55°N, 10°W. The observation from the HERMOD read a measured 64 kn wind but it is likely the wrong code for meters per second verses knots was used and the speed doubled on conversion to knots. The highest waves were only 13 ft. The higher winds were

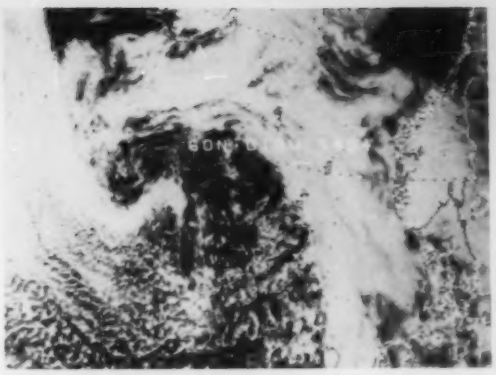


Figure 36.-- About 15 hr later the storm has moved southeastward to 58°N, 15°W. NOAA 7.

gales on the 12th with several 20-ft wave reports. The ADMIRAL CALLAGHAN (48°N, 30°W) had 35-kn northerly winds and 20-ft waves on the 13th.

The storm hit the Netherlands very hard on the 12th. Winds gusted to hurricane force. Many small sailing vessels on lakes were swamped and capsized. At least three people drowned and six were missing. The COAL TRANSPORTER and BAY CLUB broke adrift in the high winds. The PATZIEL hit a barge and the quayside. The AKARNANIA went aground. The anchor chain of the RIVER GURARA parted in Flushing Roads anchorage. The FEDERAL MAAS had heavy weather the 8th through 10th on her voyage from Europe to Montreal.

The LOW was starting to move northward and was 990 mb near 61°N, 10°W at 1200 on the 14th. The storm was gone on the 15th.

As a LOW and frontal system moved against the west coast of Greenland the LOW moved northward and the front was destroyed by the ice caps. As the lower part passed east of Kap Farvel, another LOW formed off the southeast coast of Greenland. That is what happened in this case. At 1200 on the 15th it was 978 mb near 50°N, 15°W (fig. 37). CHARLIE had gales and 20-ft

Figure 37.-- A whirlpool storm.

seas. The DEVON CITY (46°N, 25°W) measured 55-kn winds, 17-ft seas, and 25-ft swells. A ship that could not be identified near 47°N, 17°W reported 30-ft seas. ROMEO also had 30-ft seas. The GBYQ reported 52-kn winds near 47°N, 18°W. At 0000 on the 16th ROMEO measured 36-ft seas with 40-kn winds. There were many gales and seas up to 20 ft reported on the 16th as the storm sharply curved northward. The high waves continued into the 17th. The VOLODYA SCHERBATSEY (46°N, 22°W) had 30-ft seas. ROMEO had 25 ft. The storm stalled near 50°N, 05°W and dissipated on the 19th.

This storm formed off St. John's Newfoundland as a frontal wave on the 23d. It was 998 mb at 48°N, 42°W at 1200 on the 24th. The BUILDER (43°N, 43°W) had 40-kn gales. The GEORGE OUSHAKOV found 35-kn winds, 17-ft seas, and 25-ft swells on the 25th near 51°N, 41°W. The ALLTRANS ENTERPRISE (43°N, 27°W) measured 45-kn southerly winds and 13-ft waves. The storm became stationary on the 26th and no longer existed by the 28th.

This potential storm formed near Cape Hatteras on the 27th, traveled northeastward over Nova Scotia and turned eastward. On the 29th and 30th it was only a weak spot in a col area. It gained strength on the 31st. At 1200 on June 1 it was 1001 mb near 45°N, 30°W. The FARLAND (45°N, 39°W) had 40-kn winds and 15-ft waves. The MOHAWK at 43°N, 31°W had 30-kn winds and 20-ft waves that persisted into the 2d. The WINTER STAR (42°N, 25°W) measured 37-kn winds from the northwest with 25-ft seas. At 1200 on the 3d the storm was 1002 mb near 49°N, 17°W. The AMERICAN ARCHER (49°N, 15°W) measured only 20-kn southerly winds, and 5-ft seas but the swells were 20 ft. The LOW was pushing into high pressure and dissipated on the 4th.

Casualties--The landing craft LIND POINT sank off Puerto Rico on the 22d with a cargo of bricks and cement. The PAMELA and INN collided in fog off southeast Spain. All crewmen were rescued by the ferry AGADIR. The PAMELA was first reported to have sank but was later found and towed to Gibraltar. The RANGAMATI developed an 8° list in heavy weather on the 6th and diverted to Lisbon. The SOPHIAC was found to have ice damage while in dry dock on the 5th. The ZURS encountered heavy weather and a cargo of drums of nitric acid on deck shifted. Some drums burst open.

Other Casualties--The NIKEA struck the quay at Port Elizabeth in heavy weather on the 16th. The YING HING sustained heavy weather damage off Argentina.

WEATHER LOG, June 1983--There were no primary concentrated storm paths this month. Several storms tracked northeastward from the south-central U.S. East Coast. Storms tracked eastward across Labrador. Several storms tracked north-northeastward west of the Bay of Biscay toward Scandinavia. Storms from the west to south tracked into the Denmark Strait - Norwegian Sea

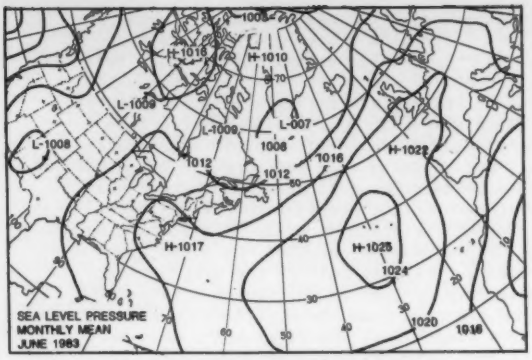


Figure 38.-- June mean sea-level pressure.

area. The most anomalous of the tracks were those west of the Bay of Biscay.

The monthly mean sea-level pressure pattern (fig. 38) was not greatly different from the 30-yr normal. The largest feature was the 1025-mb Azores High near 39°N, 30°W. This was 1 mb higher and about 400 mi northeast of its climatic counterpart. The 1007 mb Icelandic Low was on the southwest coast of Greenland (62°N, 49°W) rather than 300 mi east of Kap Farvel. There was a 1009-mb Low on the east coast of Hudson Bay, also shifted westward from its normal location. There was an anomalous 1022-mb High center near 48°N, 10°W.

The most significant anomaly center was plus 6 mb near 52°N, 25°W. High positive values extended into Northern Europe, with slightly positive values over the Mediterranean and North Africa extending seaward to 35°W. A tongue of positive values extended into the Great Lakes area. The only significant negative center was minus 10 mb over the North Pole with a trough of negative values extending southward over Greenland to Kap Farvel.

The upper-air at 700 mb showed westerly flow across the United States with a trough extending from the southwest coast of Greenland to Newfoundland and then paralleling the east coast of the United States. The winds were from the southwest over most of the ocean north of a line from Bermuda to southern Ireland and south of a line from Cape Race to Nordkapp. There was also a trough off the coast of Portugal.

Extratropical Cyclones--The month started out with a weak Azores High. There were weak LOWs over the Canadian Maritimes and one off Cape Finisterre. High pressure over Europe was increasing. By midweek there was an elongated north-south HIGH over the central ocean. The northern portion of that HIGH moved over Scandinavia leaving a large HIGH near 39°N, 43°W. The LOWs were weak.

The second week the HIGHs persisted covering all the ocean except the Labrador and Norwegian Seas. The last half of the week there was a deep LOW over Iceland and cyclonic circulation penetrated south to latitude 45°N. With the passage of the LOW the HIGH built eastward over the Bay of Biscay. The LOWs were now weak.

The third week, high pressure persisted off the coast and over Europe. There was a large LOW south of the Denmark Strait as high pressure built south of Newfoundland. At the end of the week all systems were weak.

In the fourth week, high pressure was over the central ocean north of the Azores. There were low pressure systems over the Labrador Sea and Iceland areas. By the end of the week there was a 1038 mb HIGH near 45°N, 25°W and another near Bermuda. The HIGHs drifted southward the end of the month and weakened. Frontal wave type LOWs stretched across the northern latitudes.

On June 1 a front paralleled the U.S. East and Gulf Coasts. A frontal wave that formed near Cape Hatteras was the beginning of this storm. The wave traveled northeastward gradually intensifying and moved over Newfoundland on the 3d. At 1200 it was 984 mb near 51°N, 53°W. The SEDCO 706 (47°N, 48°W) measured 49-kn winds from 190° and 10-ft seas. The BESKYTTEREN was near Kap Farvel with 47-kn easterly winds. At 0000 on the 4th, the FEDERAL THAMES was west of the front with 36-kn winds, 10-ft seas, and 30-ft swells. The storm moved over Kap Farvel about 1600 and traveled northeastward along the east coast as a weak depression.

This LOW formed on the eastern slopes of the Rocky Mountains on the 2d. Its southerly circulation was over the ocean on the 4th. (fig. 39). The COSMIC JUPITER (44°N, 64°W) had

Figure 39.-- By 1940 most of the cloudiness is off the East Coast. The storm west of Kap Farvel is the one described above. NOAA 7.

35-kn southerly winds. The GYPSUM KING reported 60-kn southwesterly winds near 40°N, 71°W at 1200 which seemed high for the gradient. No waves were reported. The CG21 (49°N, 67°W) in the Gulf of St. Lawrence had 63-kn winds also quite high. The BELVAL (46°N, 53°W) measured 42-kn southerly winds with 13-ft seas. On the 6th there were several gale reports near 47°N, 48°W. The WEST VENTURE (48°N, 49°W) was one of them with 40 kn winds and 7-ft seas. The LOW was 1004 mb near 52°N, 50°W. The storm continued tracking northeastward with no further gale-force or higher winds.

This frontal wave came out of a complex frontal system with many short waves. It was first analyzed on the 6th north of Ottawa. At 1200 on the 8th the storm was 990 mb over the Labrador Sea at 57°N, 54°W. A large 1026-mb Bermuda High was drifting eastward to become the Azores High. Three vessels near 47°N, 48°W had gales between 36 and 39 kn from the southwest. This storm tracked slightly south of Kap Farvel with the center splitting. One moved up the southwest coast and the other east-northeastward. The C.P. TRADER (42°N, 52°W) was far to the south near the front and also south of a weak frontal wave measured westerly 40-kn winds and 10-ft waves. On the 10th CHARLIE measured 45-kn winds with 21-ft seas.

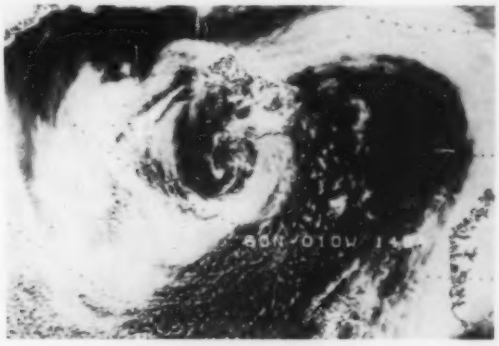


Figure 40.-- Another open eye storm. NOAA 7.

The storm deepened rapidly from 1200 on the 10th to 960-mb at 0000 on the 11th near the south coast of Iceland (fig. 40). LIMA now had 41-kn winds with 20-ft seas, and CHARLIE had 40-kn winds with 21-ft seas. The 0600 and 0900 observations had 30-ft swells. The AVON FOREST (57°N, 20°W) indicated 55-kn winds at 1200. The Icelandic fishing fleet near 65°N were indicating 37- to 52-kn north to northeasterly winds. The storm was 976 mb over the Norwegian Sea on the 12th. The severe weather was from high swells. The CASPIAN TRADER was at 49°N, 13°W with only 15-kn winds but the seas were 17 ft and the swells 33 ft. There were many other reports of 20- to 25-ft waves. By the 13th the storm was only affecting the Norwegian and Greenland Sea area.

As the storm described above crossed over the

Labrador Sea a frontal wave formed on its associated front over the Gulf of Mexico. The wave traveled northeastward along the front, which paralleled the Gulf Stream, without gaining strength until the 12th when it was 1000 mb near 48°N, 49°W. Two ships had 36-kn gales at 0000. At 0600 SEDCO 706 measured 45-kn winds from the northwest. At 1200 the BISCHOFSTOR (48°N, 27°W) had 44-kn southwesterly winds. The waves were only 8 ft. On the 13th the ASTJ (50°N, 17°W) had 47-kn southwesterly winds with 24-ft seas. Several other ships radioed reports of gales and waves near 20 ft. The storm was over the northern North Sea on the 14th. The LYNCH (56°N, 07°W) measured 30-kn 300° winds and 21-ft waves. The SERENIA (59°N, 01°W) measured 52-kn winds and 17-ft waves. The storm crossed into Norway on the 15th.

On the 13th and 14th there was a large area off the U.S. East Coast. with a weak pressure gradient. By 1200 on the 14th a double centered LOW had consolidated a circulation. At 1200 on the 15th it was a single 1002 mb LOW near 46°N, 40°W. The DHEH west of the LOW had 20-kn winds and 20-ft waves from the north. The ANTARTIC (37°N, 37°W) had southerly 47-kn winds. There were a few gale reports on the 16th and 17th with seas up to 21 ft. The storm was moving northward as it was blocked by high pressure to the east. On the 18th CHARLIE measured 31-kn winds with 15-ft seas, and 25-ft swells (fig. 41). The ARCTIC 58°N, 43°W measured 45-kn northerly winds driving 25-ft seas. From the 17th through the 21st the storm drifted from 58°N, 38°W to 61°N, 28°W. There were a few gale-force wind and high wave reports. After 1200 on the 21st the storm moved rapidly northward and was over the North Pole on the 25th.

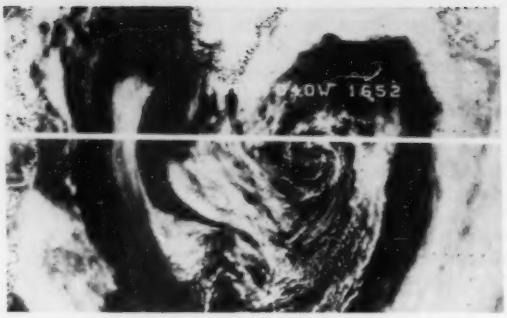


Figure 41.-- With some imagination the storm looks like the head of a fish. NOAA 7.

There were no more significant storms the remainder of the month as indicated by observations received.

Casualties--The ENO sank in heavy seas north of Gothenburg when her cargo of chain shifted on the 6th. The DARION and TENES collided in fog 15 mi off Cape Matifou, Algeria on the 7th. The MOLUND sank after a collision with the MONTE ALTO in fog off Karlskrona, Sweden on the 9th. Six crewmembers drowned when she sank in 1 min.

The PILARMAST had weather damage off Cape Finisterre June 17 to 20. The CHEMTRANS CAPELLA alleged heavy weather damage June 21-25. The tank barge ENERGY AMMONIA and the tug ENERGY ALTAIR collided in heavy weather on a voyage to Tampa, Fla. on the 22d. The ALVA BAY reportedly suffered heavy weather damage on a voyage to Rotterdam. The CONESTHMUS sank 10 mi northwest of Martinique after her cargo shifted in high winds and waves that flooded the hold.

North Pacific Weather Log

April, May and June 1983

WEATHER LOG, APRIL 1983--The primary storm track came out of northern Manchuria and across Sakhalin Island. The track continued eastward between latitudes 50° and 55°N to near longitude 170°E where it started curving northward toward the Bering Strait. There was a secondary storm track from southern Honshu eastward between latitudes 35°and 40°N to midocean. There were five storms that tracked south of latitude 30°N. There were also five storms that crossed the U.S. West Coast. The storms over the Gulf of Alaska had no organized pattern.

The mean sea level pressure pattern was much more intense than climatology (fig. 42). The Aleutian LOW was one 1000-mb center near 56°N, 180° rather than the climatic four centers of about 1009 mb stretching from near Kodiak Island to the northern tip of Sakhalin Island. The primary center of the Pacific HIGH was 1028 mb near 36°N, 160°W with a 1024 mb subcenter near

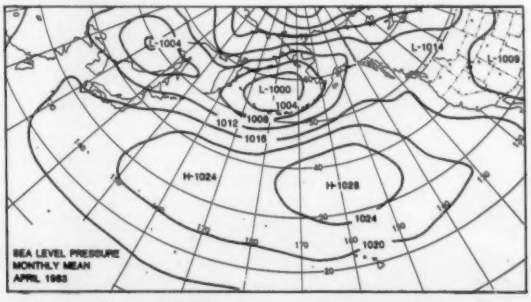


Figure 42.-- April mean sea-level pressure.

30°N, 165°E. There was an anomalous 1004-mb Low north of the Amur River.

The intense pressure centers produced many anomaly centers. There was a minus 10 mb near 58°N, 180°; a minus 9 mb near 48°N, 127°E; a minus 4 mb off northern Calif. near 40°N, 130°W;

a plus 6 mb near 40°N, 160°W; a plus 5 mb near 40°N, 158°E; and a plus 4 mb near 57°N, 144°W. These indicate the vast differences between this months mean pressure patterns and the climatic normal.

The primary circulation center at 700 mb was a 2,758 m LOW at 60°N, 180°. Normally there are two LOWs that straddle the North Pole at 80°N along longitude 80°W to 100°E. The high center was 3,183 m at 20°N, 140°E. As at the surface the gradient was much more intense than normal.

There were no tropical cyclones this month.

Extratropical Cyclones--The month started out with what could be considered a normal metsorological configuration consisting of multiple HIGHs and LOWs. There was one large-severe LOW. The Pacific High was higher in pressure and farther north than normal. There was general high pressure along the latitude belt of 35° to 40°N and it was building the end of the week.

The second week the Pacific High was 1040 mb near 43°N, 155°W. There were low-pressure areas and frontal waves south of and between the high-pressure cells. The Pacific HIGH was weakening and moving southeastward at the end of the week and severe LOW had formed.

The third week began with high pressure moving eastward out of the Sea of Japan. There was a LOW off the California coast and another HIGH over the central ocean. A strong LOW was over the Bering Sea. At the end of the week LOW pressure dominated with weak HIGHs.

The 4th week supported several strong LOWs. There was low pressure off northern California. The last of the week a strong LOW moved from Hokkaido to the Bering Sea. High pressure was moving eastward along 35°N with a strong HIGH over the central ocean the end of the month.

The first April storm was analyzed near 46°N, 162°W at 1800 on the 2d. By 1200 on the 3d the storm was 976 mb. Several ships found strong gales, including the MILLER FREEMAN with 44 kn, Buoy 46003 near the center of the storm had 20-ft waves. On the 4th the EASTERN VENTURE (54°N, 156°W) had 52-kn winds and 20-ft seas. The GALLEON AGATE (55°N, 155°W) found 36-ft swells. Barter Island on northeast Alaska had 40-kn northeasterly winds with a maximum temperature of minus 3°F. The storm was 980 mb at 0000 on the 5th south of Bethel, Alaska (fig. 43). The winds were up to strong gale strength. The ORIENTAL TAIO (53°N, 157°W) measured 45 kn winds, 26-ft seas, and 36-ft swells. The storm weakened by the 6th and dissipated on the 7th. This storm came out of Manchuria and was over the Sea of Okhotsk at 1200 on the 7th. The storm crossed the Kurile Islands at 49°N at 0000 of the 8th at 990 mb. Several ships had winds near 50 kn with waves up to 17 ft. The winds were mostly gales on the 9th. The PRESIDENT GRANT (48°N, 159°E) measured 45-kn westerly winds with 15-ft seas. The storm dissipated on the 10th and another LOW that had originated on tue front out of this LOW took over.

This was the LOW mentioned above. At 0000 on the 10th it was 998 mb near 49°N, 175°E. On the 11th the storm was 984 mb (fig. 44). The EASTERN DIAMOND (52°N, 179°W) measured 45-kn winds with 20-ft waves. At 1800 the SUZUKASAN MARU (53°N, 178°W) measured 62-kn northwesterly winds with 26-ft waves. By 0000 on the 12th the winds were down to 44 kn but the waves were 30 ft. The RUHR EXPRESS (53°N, 180°) measured 55-kn winds, 13-ft seas, and 30-ft swells. Early on the 13th the LOW disappeared but at 0000 the KAMDA (47°N, 162°W) had 42-kn westerly winds, 25-ft seas, and 41-ft swells.

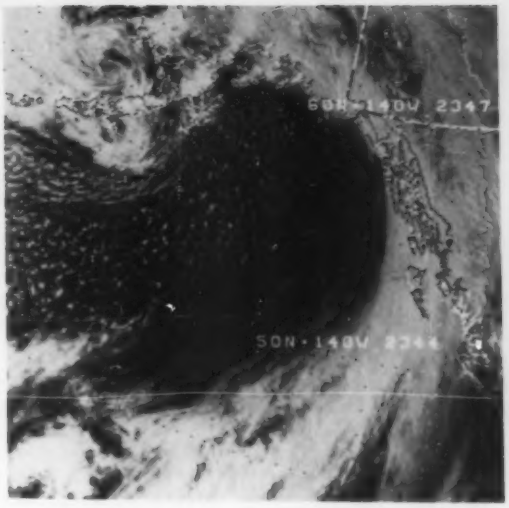


Figure 43.-- The high winds and waves were occurring under partly cloudy skies. NOAA 7.

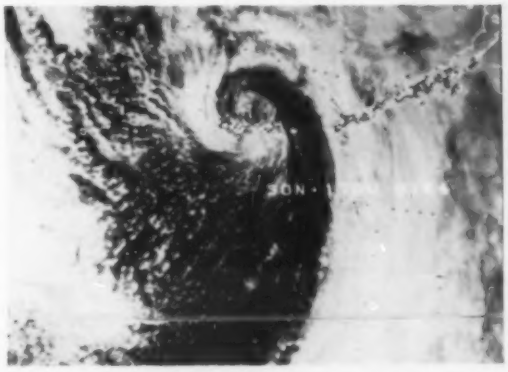


Figure 44.-- The storm is north of Adak Island, bring the usual weather to the Aleutians. NOAA 7.

This potential storm formed as a frontal wave over southern Korea late on the 9th. It moved over Tokyo early on the 11th and then started racing off to the northeast. By the 13th it was becoming better organized. It was 982-mb near 53°N, 177°W at 0000 on the 14th. There were a few gales and waves to 15 ft. Cold Bay, Alaska had 55 mi/hr winds from the southeast.

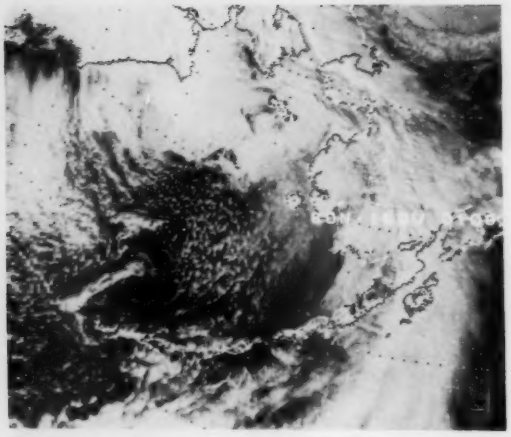


Figure 45.-- There appears to be some type of circulation near 55°N, 175°W but it does not show on either the surface or upper-air charts. NOAA 7.

The storm was 968 mb near 62°N, 175°W on the 15th (fig. 45). A ship far to the south near the front had 20-ft swells. The ASIA INDUSTRY (38°N, 174°W) had 34-ft swells. The MING MOON (35°N, 176°W) measured 53-kn winds and 15-ft waves. The storm dissipated on the 17th.

The Amur region of the USSR produced this LOW. Its southerly winds were affecting the ocean on the 15th. The ANJA LEONHARDT (33°N, 137°E) measured 54 kn south winds. Strong gales were occurring on the 16th.

At 1200 on the 16th another LOW center was analyzed east of Kamchatka. Forty kn winds were measured along the Kuriles. By 0000 on the 17th the eastern LOW was the primary center. The winds were increasing to storm force and the waves increasing in height. The 8KSB (50°N, 168°E) measured 41-kn winds with 13-ft seas and 43-ft swells. Kiska Island had 45-kn winds. At 0000 on the 18th the storm was 964 mb near 63°N, 179°E. The winds were mostly gales with waves up to 23 ft. The storm weakened rapidly on the 19th and was no longer on the analysis on the 20th.

The Amur River plain produced yet another storm on the 19th. The storm intensified on the 21st after crossing the Kurile Islands. Winds up to 45 kn were reported by the GREEN FOREST (43°N, 155°E). A Soviet ship (47°N, 152°E) had 20-ft seas. On the 22d the PRESIDENT MONROE (40°N, 176°E) had 45-kn winds and 12-ft waves. The MIDAS RHINE (53°N, 179°E) found 52-kn winds and 23-ft seas. The storm was 964 mb (fig. 46). On the 23d her winds were 48-kn with 28-ft seas. As the storm moved over the icy northern Bering Sea waters it dissipated rapidly.

This LOW came out of the area north of Lake Baykal. It was still over the Amur Region on the 22d at 980 mb but the southerly flow was over the water. There were some gales. On the 23d the MAIN EXPRESS (37°N, 161°E) had southerly

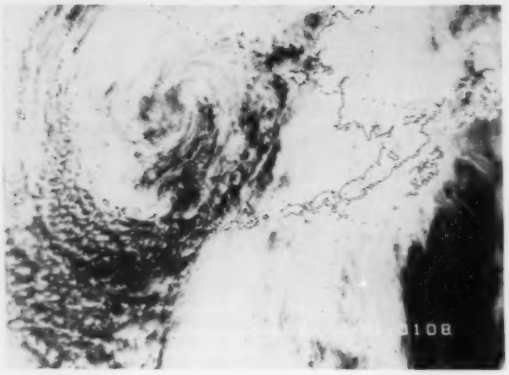


Figure 46.-- The heavy weather was south of the Aleutians according to the reports. NOAA 7.

39-kn winds and 25-ft waves. At 0000 on the 24th the LOW was still over the Sea of Okhotsk. The winds were generally less than gale force. A second LOW had developed east of Kamchatka. By 0000 on the 25th both LOWs were east of Kamchatka. The winds were light. On the 27th the two centers combined into one. The storm turned northwestward back into Siberia on the 28th and disappeared.

A large LOW traveled northeastward over northern China on the 26th. It brought strong winds to the East China and Yellow Seas. There were gales over the Sea of Japan early on the 27th, but later in the day the storm started falling apart as another LOW formed north of Hokkaido. This new LOW started moving eastward under zonal flow and strengthening. There were some gales but the SOUTH LIGHT (44°N, 162°E) measured 45-kn winds from the southeast.

Figure 47.-- This satellite image gives no indication where the storm is centered. NOAA 7.

At 0000 on the 29th the storm was 984 mb near 48°N, 170°E (fig. 47). The ORIENTAL MINISTER (43°N, 173°E) had 40-kn south winds and 20-ft waves. At 1200 the HIKAWA MARU (50°N, 164°E) had 42-kn out of the northwest. The storm was now traveling toward the north and temporarily strengthened on the 30th. Two ships reported 54-kn winds. They were the

TORRENT (49°N, 171°E) from 280° with 26-ft waves and the PAVEL RYBINE (50°N, 176°E) from 220° with 16-ft waves. The storm center was less than 30 mi from the PASY which had a pressure of 983.1 mb verse an estimated central pressure of 980 mb.

The storm was weakening again on May 1 and dissipated over the Bering Strait on the 3d.

Casualties--The SAND CARRY No. 1 capsized off Kunsan on the 2d in heavy weather. Eight of crew of 12 drowned. A Chinese drilling barge capsized in the North China Sea the last week of the month. The MAH KIM had damage and cargo shifted on the 29th and 30th on a voyage from Osaka to Bangkok. On the 27th, the SHINYO MARU No. 306 ran aground in dense fog near 34°N, 130°E.

The ARAUCO had heavy weather damage to containers. The STAR SINGAPORE suffered a crack in a bottom tank. The TITUS lost anchor cables and sustained windlass damage due to high winds on the 29th. The COSMOS brroke tow from the KAME MARU west of the La Perouse Strait.

Other Casualties--The barge EVA sank due to heavy weather near Juaymah. The following crayfishing vessels were blown on the rocks of Kangaroo Island, Australia on the 10th; NEA, ORIGIN, JO DE II, and BONNY MAC. The MAERSK HELPER contacted the platform EPOCH M. EPOCH in Bass Strait on the 15th in heavy swell. The POLARIS sustained damage to the gantry crane in heavy swell in Bay Strait on the 19th.

WEATHER LOG, May 1983--There were more LOWs on the charts than the track chart indicates. They are not shown on the track chart unless they persisted for longer than 30 hr. Many of the LOWs this month did not persist that long. There were several short primary tracks this month as a result of the cyclone tracks crossing each other and then dispersing. One such track was from Hokkaido into the western Bering Sea, another was from approximately 47°N, 167°E to 48°N, 180°, a third track was from about 48°N, 157°W to 52°N, 152°W. Few storms penetrated north of latitude 60°N. There were three anomalous cyclones between Hawaii and California. A primary track that originates south of Honshu according to climatology did not exist. There were fewer than normal cyclones in that area.

The monthly mean sea-level pressure pattern was near normal (fig. 48). The primary Aleutian Low was 1006 mb near 54°N, 170°W. It was 3 mb lower and only a few miles from the normal. A second 1009 mb was just south of Mys Lopatka. The Pacific High was 1025 mb near 34°N, 145°W almost identical with the climatic normal except 2 mb higher. The normal ridge existed off the North American west coast.

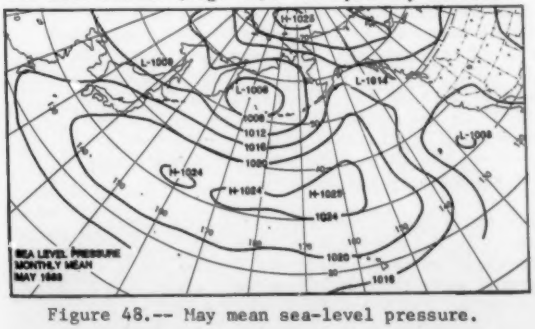


Figure 48.-- May mean sea-level pressure.

Since the sea-level pressure pattern so closely matched the long-term normal the anomaly centers were weak. A -4 mb area was south of Umnak Island. There was a +4 mb center near 30°N, 170°E. In general, the area north of a line from the Tsugaru Strait to 42°N, 155°W, to Yakutat Alaska had below normal sea-level pressure, while the large area to the south and east of that line was above normal.

The upper-air flow as represented by the 700-mb level was primarily zonal between latitudes 30° and 50°N from Asia to 160°W longitude. From 160°W it turned northeastward to 140°W then south of latitude 45°N the flow turned southeastward. The flow to the north of 45°N formed the usual ridge over Canada and Alaska. The gradient across the 30° to 50° latitude belt was more intense than normal, 329 m versus 270 m according to climatology.

Hurricane Adolph formed in the eastern North Pacific this month. The first storm this year over the western ocean did not form until June.

Extratropical Cyclones--The first week of the month started out with a near normal weather pattern. The Pacific High was near 35°N, 155°W, 10° longitude west of its climatic location. LOWs were tracking northeastward then eastward across the top of the HIGHs. Weak HIGHs were tracking eastward out of Asia, reinforcing the Pacific HIGH and it moved westward. This allowed a LOW to form off Oregon.

The second week the Pacific HIGH moved back eastward to its normal location and another HIGH moved over the central ocean. The LOWs were developing further south over the western ocean. At midweek the Pacific HIGH extended north along the Canadian coast.

There was a severe LOW during the third week as low pressure dominated the ocean area. Later in the week the HIGHs started to build and the LOWs were kept farther west. The Pacific HIGH was near 43°N, 137°W with HIGHs along latitude 35°N over the western and central ocean.

The fourth week started with high pressure over the northeastern ocean and two weak LOWs imbedded in the weaker high pressure to the south. Later the HIGHs were breaking down and moving southward allowing the northern LOWs to penetrate farther south. By the end of the month the subtropical HIGHs were south of latitude 35°N and weak. There were multiple low pressure centers.

The first storm of the month came out of Siberia. At 0000 on the 4th the storm was 1002 mb near 55°N, 170°E. The TONCI TOPIC (49°N, 161°E) had 41-kn westerly winds. The KOREAN ZIRCON (38°N, 176°E) had 46-kn easterly winds south of the cold front. On the 5th the GARDENIA measured 47-kn winds from the west and 15-ft seas, while

the SEA-LAND ENDURANCE (50°N, 169°W) measured 33-kn winds from 280° with 20-ft swells.

By 0000 on the 6th the 993-mb LOW was at 54°N, 145°W. The HOHSING BREEZE(48°N, 158°W) had 40-kn winds, 20-ft seas, and 25-ft swells. The SEA-LAND ENDURANCE now at 50°N, 155°W measured 28-kn northwesterly winds, 5-ft seas, and 25-ft swells. The LOW crossed the coast on the 8th, barely discernible on the analysis.

This LOW formed southeast of Kamchatka on the 6th in the frontal trough of a LOW over the Kurile Islands. The PRESIDENT JEFFERSON (35°N, 178°W) had 40-kn winds and 13-ft waves on the 7th. The BAHAMA MARU (44°N, 171°W) measured light 20-kn winds but had 26-ft swells. On the 8th the LOW was 994 mb near 49°N, 170°W. The YAMASHIN MARU (43°N, 177°E) measured 48-kn westerly winds and 15-ft waves. The QUATSINO SOUND (37°N, 176°E) had near-gale winds of 28 kn with 30-ft swells. North of the storm the HOZP measured 37-kn northeasterly winds and 20-ft seas. The GLOBAL FRONTIER (39°N, 168°W) had 30-kn winds and 26-ft waves on the 9th. The MAIN EXPRESS (54°N, 151°W) measured 32-kn southeasterly winds and 26-ft waves on the 10th. King Salmon measured winds of 39 mi/hr. Later in the day the MAYA PIONEER and EASTERN VENTURE in the vicinity of 51°N, 144°W had gales and 20-ft waves. The EASTERN VENTURE continued to measure 36-kn winds, 17-ft seas, and 21-ft swells on the 11th. The LOW disappeared on the 12th.

This frontal wave formed south of Okinawa on a front that plunged to 25°N on the 10th. The storm turned northward on the 11th with showers and thunderstorms near the front. On the 12th the BUNGA SRIPAGI (33°N, 137°E) measured 34-kn northeasterly winds with 20-ft waves. At 0000 on the 13th the 980-mb storm was near 32°N, 142°E. The AFRIKA MARU (32°N, 147°E) measured 46-kn southeasterly winds and the SUN PLUM (36°N, 150°E) had 50-kn southerly winds but reported no seas. There were many gale-force wind reports on the 14th around the 990-mb storm. Among them were 43-kn easterly winds, 21-ft seas, and 25-ft swells by the STAR CARRIER

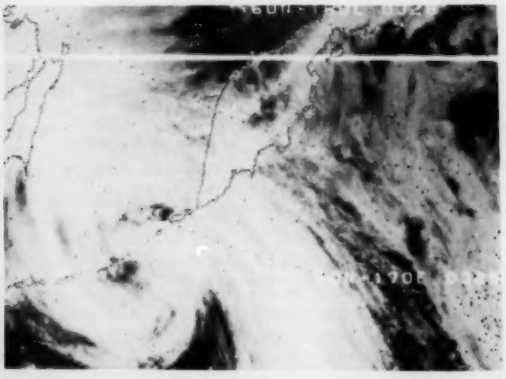


Figure 49.-- This was a very strong storm to dissipate in 24 hr. NOAA 7.

at 48°N, 159°E. The profusion of gales and waves near 20 ft continued into the 15th and 16th (fig. 49). The PACMERCHANT (48°N, 167°E) and NEPTUNE DIAMOND (44°N, 151°E) both had 48-kn winds and waves up to 17 ft. Several ships had storm-force winds on the 16th. These included the INACHUS STAR with 54 kn and the PACIFIC ARROW with 52 kn. The GALLION DIAMOND (45°N, 150°E) reported 33-ft swells, and the GLOBAL FRONTIER (42°N, 158°E) had 26-ft seas.

By 1200 on the 16th a new low-pressure center had formed 600 m to the east and the original center quickly dissipated. At 0000 of the 17th the storm was at 45°N, 170°W. The circulation extended into the Gulf of Alaska. The SINCERE No. 3 (38°N, 176°W) measured 34-kn winds, 13-ft seas, and 33-ft swells. The ATLANTIC CHARITY (37°N, 170°E) measured 54-kn winds from 310°. The storm weakened rapidly on the 18th and was gone by the 19th.

The East China Sea was the birth place of this storm. The storm developed very rapidly and raced along most of the length of Honshu. At 0000 of the 17th it was 989 mb at 40°N, 145°E. The SUN BELT DIXIE (36°N, 144°E) measured 36-kn winds, 20-ft seas, and 25-ft swells. The ASIA HERON (35°N, 143°E) measured 50-kn winds out of the southwest, but only 15-ft waves. There were many gale and 15- to 20-ft wave reports. At 0000 on the 18th the storm was 976 mb near 49°N, 159°E (fig. 50). Gales and waves up to

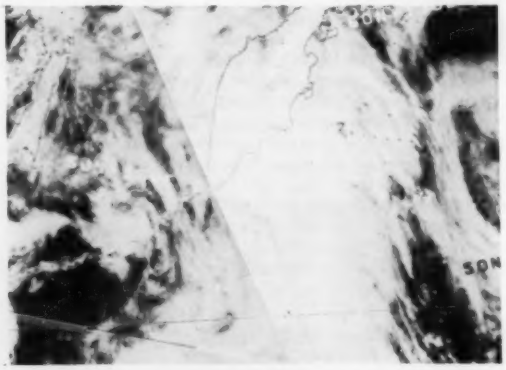


Figure 50.-- Another storm where the center can not be determined by satellite. NOAA 7.

25 ft continued. The VERRAZANO BRIDGE measured 46-kn winds. The ORIENTAL EXECUTIVE (51°N, 165°E) measured 33-kn winds from the southwest with 21-ft seas, and 25-ft swells. Her winds increased to 38 kn on the 19th but the waves decreased to 20 ft. The PRESIDENT GRANT (53°N, 177°E) in the Bering Sea measured only 15-kn winds with 20-ft swell waves. Her waves were 23-ft on the 20th. The storm weakened rapidly and was gone on the 21st.

This was a long-lived storm for this time of year. It originated over Hokkaido on the 22d. The storm moved eastward and on the 23d a frontal wave raced northeastward about 400 m to the east. The SEA-LAND LIBERATOR (47°N, 169°E) found 44-kn easterly winds and 17-ft seas. On

the 24th the two systems merged near 49°N, 178°E at 993 mb. The KOREAN ZIRCON (53°N, 156°W) measured 51-kn southerly winds late on the 25th. At 0000 on the 26th the storm was 994 mb near 54°N, 160°W. The SANKOGRAIN (48°N, 172°W) had gales and 20-ft waves. At 1800 the EXXON PHILADELPHIA (57°N, 142°W) measured 32-kn easterly winds and 20-ft waves. The MOBIL MERIDIAN (59°N, 143°W) had 30-kn winds from the east with 13-ft seas, and 21-ft swells on the 27th. The storm was moving southward and weakening.

This frontal wave formed east of Tokyo on a front that stretched across two-thirds of the ocean on the 25th. On the 26th the KATORISAN MARU (33°N, 144°E) sent an 0900 observation of 40-kn northeast winds with 20-ft waves. At 1200 on the 27th the storm was near 44°N, 166°E at 997 mb. A Japanese ship was about 90 m northwest of the storm's center with 41-kn northerly winds. The storm was 976 mb at 1200 on the 28th (fig. 51). The SANKOGRAIN (48°N, 170°E) measured 45-kn northwest winds. The NICHIYU MARU near 48°N, 175°E had 45-kn west winds, 12-ft seas and 30-ft swell at 0600. At 1200 the swells were 23 ft. The storm was paralleling the Aleutians. The RIGOLETTO (49°N, 175°W) had 55-kn west winds and 23-ft seas, on the 29th, 360 mi south-southwest of the center of the storm. The ASIA MARU (54°N, 160°W) had only 15-kn southerly winds but the swell waves were 25 ft. On the 30th a ship near 51°N, 169°W measured 35-kn winds and 21-ft waves. The storm was gone on June 1.

Figure 51.--The storm center is about to move into the Bering Sea. NOAA 7.

This frontal wave formed near Shanghai on the 30th. It raced eastward south of Japan and was east of Tokyo at 0000 on the 31st. The THONBURI (33°N, 137°E) measured 43-kn northeasterly winds. The storm did not really intensify until June. By 1200 on June 1 it was 984 mb near 37°N, 167°E (fig. 52). At 0900 the NISSAN MARU (35°N, 165°E) had 55-kn southwesterly winds and at 1200 they were 52 kn with 13-ft waves. The PIONEER No. 3 (37°N, 161°E) had 38-kn winds from the north. On the 2d the MAIN EXPRESS (42°N, 174°E) was north of the center with 34-kn northeasterly winds and 25-ft swell

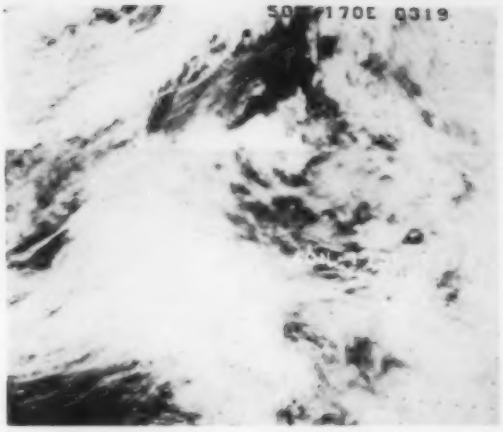


Figure 52.-- The center is buried under the solid cloud mass on the lower left. NOAA 7.

waves from the east. The SAXONIA about 600 mi southwest of the center had only 5-kn winds but the swells were 26 ft. There were quite a few gale reports on the 3d with waves as high as 26 ft. At 0000 June 4 the storm was 993 mb near 44°N, 166°W. The MAIN EXPRESS (42°N, 168°W) was following the storm and had 28-kn winds with 26-ft swells. The 9VHL (43°N, 159°W) measured 50-kn winds from the south. Some gales continued into the 5th but the MAIN EXPRESS (42°N, 153°W) was now reporting 57-kn winds from 210°. There were no waves with this report. On the 6th the storm was weakening rapidly.

A powerful earthquake that registered 7.8 on the Richter scale struck northern Japan on May 26. It was centered 80 mi northwest of Akita off the west coast of Honshu (fig. 53). It triggered a tidal wave of 6 to 19 ft along the northwest coast of southern Hokkaido and northern Honshu and 24 ft along the coast of the USSR. At Minchana, Honshu the tsunami was up to 46 ft. At least 87 persons died and 15 were missing. One report said that 658 houses were destroyed or damaged by the tremor and tidal wave, it sank 621 vessels. The tidal wave also struck Korea with 18 ft at Samchul. Korea reported 74 vessels destroyed and 61 houses washed away.

Casualties--The SPLENDID FORTUNE and the SUNNY PIONEER collided on the 7th in Yokohama Roads in sudden strong winds. The coastal ferry and freighter ROMMEL sank in rough seas off the northern Philippines on the 27th. Three people were confirmed dead, 28 missing, and 44 survivors.

Other Casualties--The ACT 5 encountered heavy weather between Wellington and Melbourne on the 7th. The BRAZILIAN REEFER returned to port after encountering heavy weather with damage about 100 mi west of Cape Farewell, New Zealand. The AL FARZANA AJMAN was intentionally grounded near 25°N, 59°E after suffering heavy weather damage in the Gulf of Oman. The TUMI was blown into the CHALLWA V at Paita, New Caledonia.

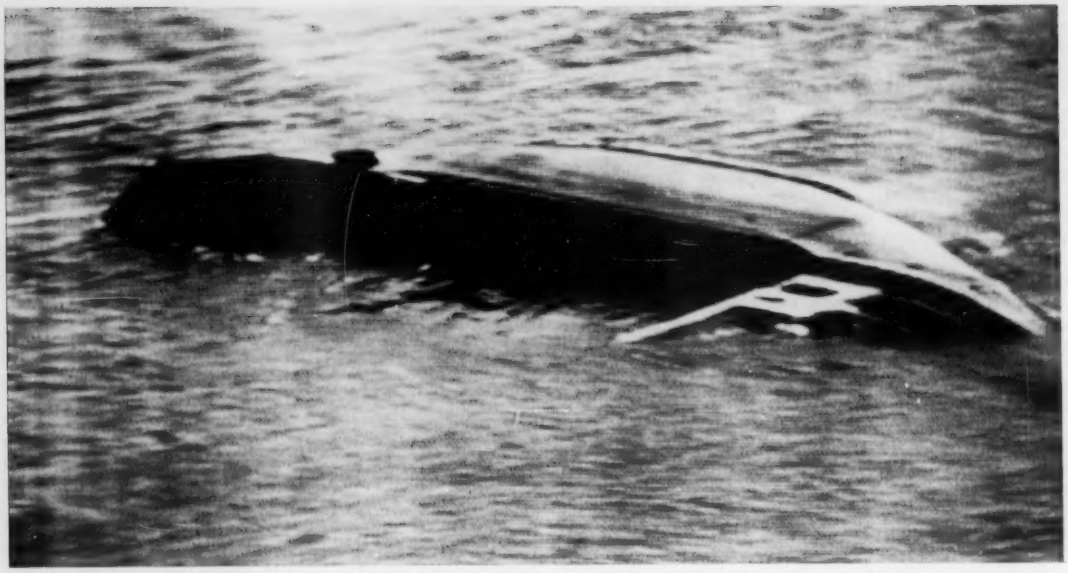


Figure 53.-- This Japanese freighter was swamped by the tidal wave near Akita port. At the time this photograph was taken it was not known if the crew survived. Wide World Photo.

WEATHER LOG, JUNE 1983--The storm tracks were mainly concentrated in an approximately 10° latitude band, the center of which, stretched on a rhumb line track from Kyushu to the Queen Charlotte Islands. This followed the primarily zonal upper-air flow along the same latitude belt from the Asian to the North American coast. There was a weak secondary storm track from Mys Navarin into the Yukon passing slightly north of Fairbanks, Alaska.

The mean sea-level pressure pattern closely matched the 30-yr normal except for an anomalous 1017-mb HIGH over the Sea of Okhotsk (fig. 54). The double center Aleutian LOW was displaced about 200 mi south of its normal position. There was a 1006-mb center near 51°N, 158°W and a 1007-mb center near 48°N, 175°W. These were 5- and 3-mb lower than their respective counterparts. The Pacific HIGH at 1026 mb matched its climatic normal both in pressure and locations near 34°N, 143°W.

The primary feature of the anomaly analysis was a -8 mb center near 50°N, 152°W with a -6 mb subcenter near 50°N, 173°W. The anomalous HIGH over the Sea of Okhotsk produced a +7 mb center. The Pacific and subtropical HIGH produced a +2 mb closed isoline with a 4 mb spot maximum near 29°N, 180°.

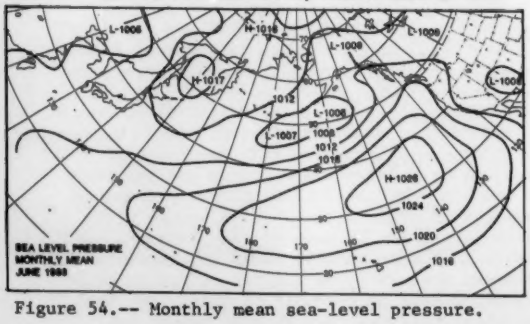


Figure 54.-- Monthly mean sea-level pressure.

The upper-air pattern at 700 mb was zonal between 25° and 40°N latitude on the China coast to between 33° and 43°N at 180° to between 38° and 48°N at 140°W. The LOW at 2,914 m was a flat oval centered near 51°N, 172°W. The HIGH of 3,216 m was centered near 29°N, 166°W. There was ridging over northwest Canada and Alaska, and a trough over California. The split between the ridge and trough was over Oregon.

Hurricane Barbara occurred over the eastern ocean and tropical storm Sara, the first of the year over the western ocean.

Extratropical Cyclones--The month started out with a typical sea-level pressure configuration of HIGHs and LOWs. The first storm was one that originated in May but the severe part was this month. The Pacific HIGH was larger than normal. LOWs were tracking northeastward from Japan, then turning more northward as they moved against the HIGH. High pressure extended across the ocean along the subtropical latitudes. The Pacific HIGH was weakening by the end of the week.

The second week the LOWs in general had a larger circulation but were not necessarily stronger. The Pacific HIGH continued to break down as the LOW centers penetrated as far south as latitude 45°N near the U.S. West Coast.

By the third week the Pacific HIGH was building again north of Hawaii and moving eastward. A large HIGH moved southeastward out

of Siberia. A strong LOW was south of it and the HIGH broke into small cells. There was a continuing parade of LOWs.

The parade of LOWs continued into the fourth week. The Pacific HIGH again weakened and flattened into an east-west flat oval.

The first relatively severe storm this month had its origins over China and moved eastward across Okinawa on the 5th. The FORT NANAIMO (31°N, 131°E) had only 23-kn northeasterly winds on the 6th but found 20-ft swell waves. There were gales on the 8th and the KAIWO MARU reported 40-kn winds near 37°N, 161°E, south of the center. There were some reports in the 40-kn category on the 9th and the AVILA (40°N, 171°E) reported 50-kn westerly winds with 10-ft seas and 23-ft swells. The LOW was 980 mb near 47°N, 177°E. At 1800 the ORIENTAL GOVERNOR (43°N, 171°W) measured 47-kn southeasterly winds. The GALLEON EMERALD (41°N, 170°E) had 33-kn winds and 23-ft waves on the 10th. The storm was weakening on the 11th but continued to exist through the 12th.

Stable frontal waves had been forming on a front that paralleled latitude 28°N. On the 9th an unstable wave continued to develop and by 0000 on the 12th was 996 mb near 33°N, 161°E. There were now reports of gales and waves over 20 ft. The ROSE (40°N, 172°E) measured 58-kn easterly winds with 17-ft seas. The SEPTA (42°N, 161°E) measured 42-kn winds out of the north with 23-ft waves. The SEA-LAND MARINER (43°N, 170°E) measured 38-kn winds and 25-ft seas on the 13th. The PRESIDENT GRANT (49°N, 179°E) also measured 38-kn winds from the east and 23-ft seas. A ship near 43°N, 177°E claimed 52-kn southeasterly winds.

On the 14th the storm was 984 mb near 47°N, 173°W (fig. 55). The OCEAN BEAUTY (49°N, 172°W) measured 27-kn winds with 30-ft seas, and 33-ft swells. The HOEGH CAIRN (42°N, 172°W) found 48-kn winds. The higher winds were only gales on the 15th. The CHARLOTTE MAERSK (38°N, 168°W) had 25-ft swell waves. The storm was 990 mb at 51°N, 151°W. The winds were now light but there were quite a few 20-ft swell wave reports. On the 17th the OCEAN BEAUTY was at 46°N, 147°W with 32-kn winds, 26-ft seas, and 30-ft swells. The storm broke up against the mountains on the 18th.

Figure 55.-- The satellite image verified the analysis. Note the cloudless shadow to the lee of Aleutian Islands. NOAA 7.

This storm was born over the Yellow Sea on the 12th and moved across Honshu on the 13th. The STAR DIEPPE (36°N, 142°E) measured 45-kn southerly winds. The CALIFORNIA RAINBOW nearby (35°N, 143°E) measured 42-kn southerly winds with 12-ft waves. On the 14th there were many wind reports in the lower 40-kn category. The SEVERNYY POLUS (42°N, 147°E) measured 48-kn easterly winds and 13-ft seas. A ship nearby reported 23-ft seas. The KGJF reported 46-kn winds and 23-ft waves near 38°N, 151°E on the 15th. The storm continued its northeast track gradually weakening as it pushed over the 1034 mb Pacific HIGH.

Monster of the Month--A series of frontal waves had been rippling along a front south of Japan. One of these on the 17th continued to develop into a wave cyclone. It moved east-northeastward and was 1000 mb on the 19th. The WAKO MARU (37°N, 157°E) measured 40-kn winds with 17-ft waves. By 0000 on the 20th it was 988 mb near 38°N, 158°E (fig. 56). There were several

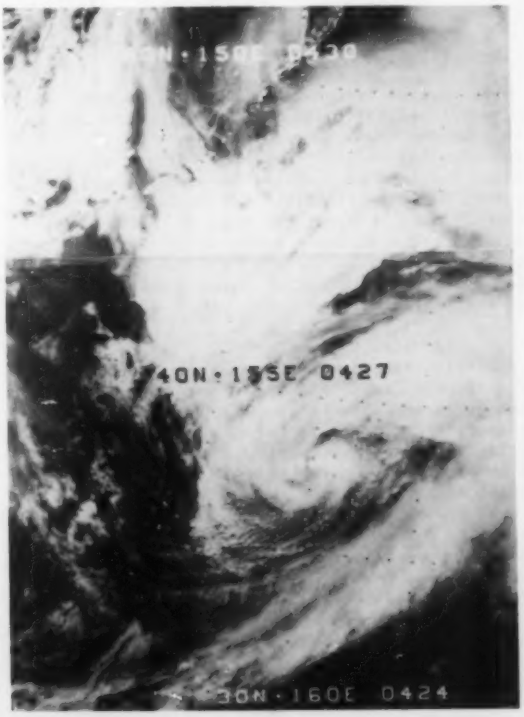


Figure 56.-- The storm had moved to near 160°E by 0426. NOAA 7.

storm-force wind observations. The strongest was by HAKUKO MARU (38°N, 160°E) of 63-kn winds from 200° and 43-ft seas. At 0300 the winds were 41-kn and the seas 30 ft. At the same time another ship at 37°N, 157°E measured 47-kn northwesterly winds, 15-ft seas, and 30-ft swells. On the 21st the winds were down to gales, but reports on the 22d were up to storm force again. The ALIOTH (44°N, 179°W) measured 52-kn winds and 23-ft waves 150 mi southwest of the 987-mb storm. A ship about 200 mi northwest of the center had 48-kn winds and 18-ft waves. The SEA-LAND ENDURANCE (45°N, 175°W), about 120 mi southeast of the center found 40-kn winds and 25-ft waves.

The 23d found the storm near 50°N, 170°W with gales and waves over 20 ft. The ANNA MAERSK (51°N, 168°W) had 23-ft waves. The storm deteriorated rapidly on the 24th and was no longer on the analysis on the 25th.

Another storm out of the Yellow Sea. It moved over Honshu on the 20th. There were gales in the southerly flow ahead of the storm on the 21st. The ALPS MARU (36°N, 149°E) measured 48-kn winds from the south and 15-ft waves. The CHIKUBU MARU (45°N, 154°E) had an 0900 observation of only 4 kn winds from 210° but the swell was 41 ft from 130°. Another ship not far away had southeasterly 15-kn winds but reported no waves.

At 0000 on the 22d the storm was 992-mb near 39°N, 149°E. Most of the gale-force winds were in the eastern half of the storm. The waves were up to 20 ft. The CLOVER TRUST (40°N, 147°E) measured 45-kn northeasterly winds and 20-ft seas. The winds were decreasing on the 23d and 24th but two ships had high swells. The YOUNG SOLDIER (36°N, 165°E) had 30-ft swells and the ORANGE ACE (43°N, 157°E) had 26-ft swells. The storm died on the 28th.

Casualties--The BULACAN suffered heavy weather damage the first part of the month. The ESTEDEICH sank in the Arabian Sea. The FALCON EXPRESS struck the jetty at Sharjah in gusty winds. The Thai fishing vessel CHOKE SAYANI-3 capsized and sank in a gale off Borneo. Seventeen crewmen were rescued after 7 days by the NIKOLAY MAKSIMOV.

The ATHENA was abandoned in sinking condition on the 10th after developing leakage in rough seas. She was sighted on July 13 and a tug was dispatched to investigate.

Hurricane Alley

Dick DeAngelis
National Environmental Satellite, Data, and Information Service
Washington, D.C.

The tropical cyclone tracks (fig. 57) and the summaries that follow are based on information provided by A. Theron, Chief of the Meteorological Service of French Polynesia, Malakai Tadulala of the Fiji Meteorological Service, C.G. Revell of the New Zealand Meteorological Service, Ted Tsui of the Naval Environmental Prediction Research Facility, the Joint Typhoon Warning Center, and the Eastern Pacific Hurricane Center of NOAA. These agencies and people were most helpful.

TROPICAL CYCLONES--APRIL 1983

Activity this month was above the normal of three tropical cyclones, one or two of which reach hurricane intensity. Of the five tropical cyclones, four formed in the Australia - South Pacific region and two of these were hurricanes; one tropical storm developed in the South Indian Ocean (table 5).

Lena and Monty, the first and last storms of the month, formed northwest of Australia. Lena, which developed in the Timor Sea just south of Sumba on the 3d, moved along a classic parabolic-shaped track. Lena's winds climbed to 55 kn before she moved ashore. The storm made landfall near Port Headland in Western Australia on the 8th. Monty spent his life at sea but despite this, his winds climbed to a maximum of only 55 kn on the 25th. A few days later, after crossing the 25th parallel, he weakened to a depression. While Monty was roaming the seas off Australia, a short distance

Table 5.--Global tropical cyclone summary April, May and June 1983.

No.	Name	Est. max. wind (kn)	Basin	Dates
		April 1983		
1	Lena	55	Aust.-S. Pacific	3-8
2	Veena	100	Aust.-S. Pacific	7-14
3	William	80	Aust.-S. Pacific	15-23
4	Naomi	60	S. Indian	19-30
5	Monty	55	Aust.-S. Pacific	23-28
		May 1983		
1	Adolph	95	E. North Pacific	21-28
		June 1983		
1	Barbara	115	E. North Pacific	9-18
2	Sarah	35	W. North Pacific	19-26

to the west Naomi had come to life in the South Indian Ocean. After meandering aimlessly for several days as a depression, Naomi reached tropical storm strength on the 22d. By the 24th she was heading toward the west-southwest. Maximum winds climbed to 60 kn on the 25th and 26th--about the same time Monty reached his peak. Naomi began to weaken and by the 30th was a depression before reaching the 20th parallel.

The hot activity continued well east of the dateline. In the far reaches of the South Pacific, William and Veena took parallel courses

NOTE: Figure 57 is on pages 242 and 243.

about a week apart as trouble continued in paradise. These were just two of six tropical cyclones to develop east of 160°W this season. To appreciate the enormity of these occurrences it should be realized that only about 20 tropical cyclones have affected the Tuamoto Archipelago since 1825.

In April Veena became the most damaging tropical cyclone to hit Tahiti in the past century. She originated as a depression some 130 mi south-southeast of Hira Oa, in the Marquesas Islands, on the 7th. The following day Veena was christened as maximum winds climbed to 35 kn near her center. Moving west-southwesterly Veena continued to intensify. Maximum winds reached hurricane force on the 10th as the storm slowed and began to recurve toward French Polynesia. She maintained hurricane intensity for the next 3 days during which time she battered French Polynesia. At about 1600 on the 10th a small eye became visible and during the next 24 hr there was a rapid intensification; winds increased from 65 kn to 100 kn within a 12-hr period. On the evening of the 11th, with a minimum 950-mb pressure, the cyclone was heading directly for Tahiti at 6 kn but during the night she changed course toward the south then southeast and her forward speed increased to 10 kn (fig. 58).

From midnight until noon on the 12th (fig. 59) strong winds and rough seas pounded Tahiti. Faaa International Airport reported winds up to 88 kn with a minimum pressure of 978 mb (fig. 60). Waves along the east coast of Tahiti reached 16 to 23 ft. From the 11th through the

Figure 59.-- NOAA 7 on April 12 at 1515.

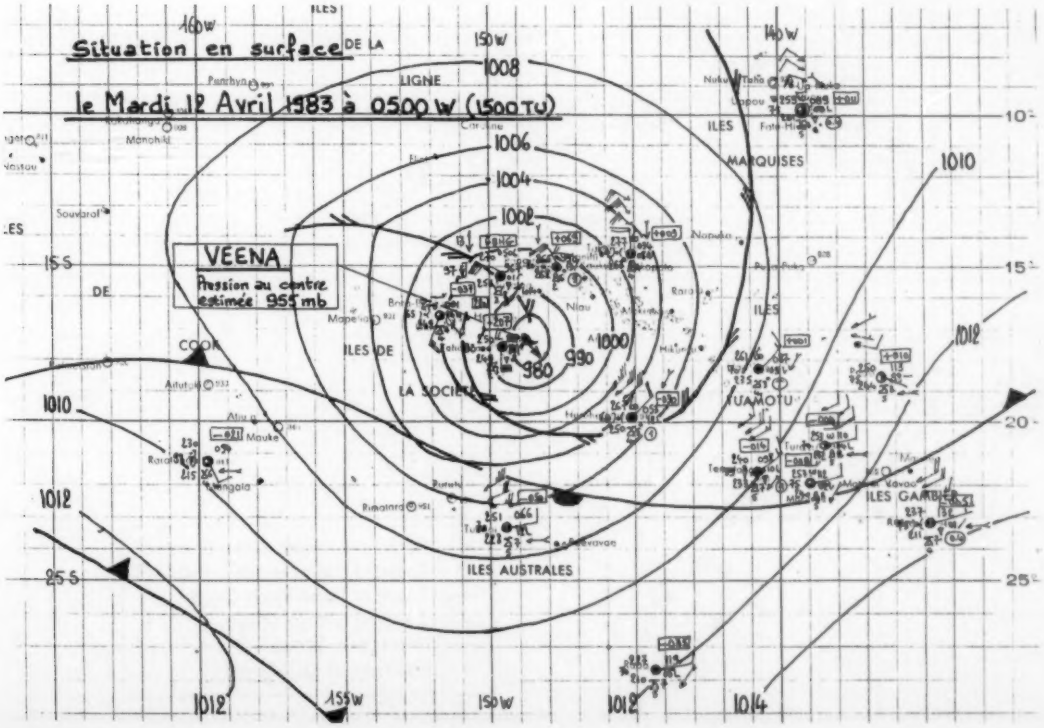


Figure 58.-- Surface analysis of Veena courtesy of the Meteorological Service of French Polynesia.

13th Veena was tracked by radar from the CDT BORY and the radar at the airport. On the 13th Veena passed about 30 mi east of Tahiti which along with nearby Moorea took the full brunt of the storm for about 12 hr. By midday on the 13th Veena began to accelerate southeastward and slowly weaken.

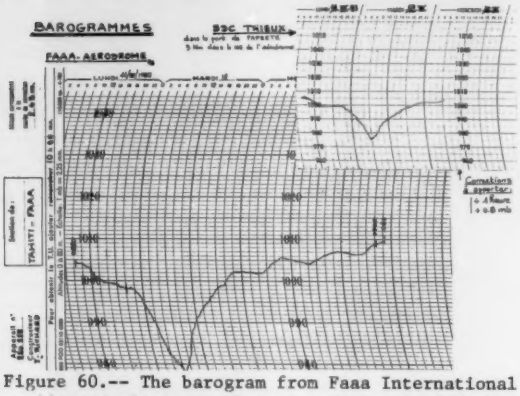


Figure 60.-- The barogram from Faaa International Airport showing a minimum pressure of 978 mb about 0630, and at Papeete of 976 mb.

The damage throughout the islands was severe. Tahiti and Moorea, the two major tourist resorts, reported more than 3,000 houses destroyed or damaged, along with 60 public buildings and numerous hotels, restaurants, and offices. One life was lost when a 28-yr old woman was electrocuted by a downed powerline. About 5,000 people were left homeless. Several atolls sustained severe damage from the winds and from enormous seas breaking over the reefs. Tikehan and Mataira were practically destroyed while Makatea and Rangiroa suffered to a lesser extent. On Tahiti a 200 ft television tower was blown down while the meteorological station at Faaa lost its roof. A number of fishing pleasure boats were sunk or driven aground.

The hurricane wiped out most of the crops, cut roads, and washed away bridges. Most of the electrical and telephone networks were destroyed while major water supply pipes were seriously damaged. Unofficial estimates put the damage at about $86 million.

William developed near 132°W on the 15th. This is about as far east as any tropical

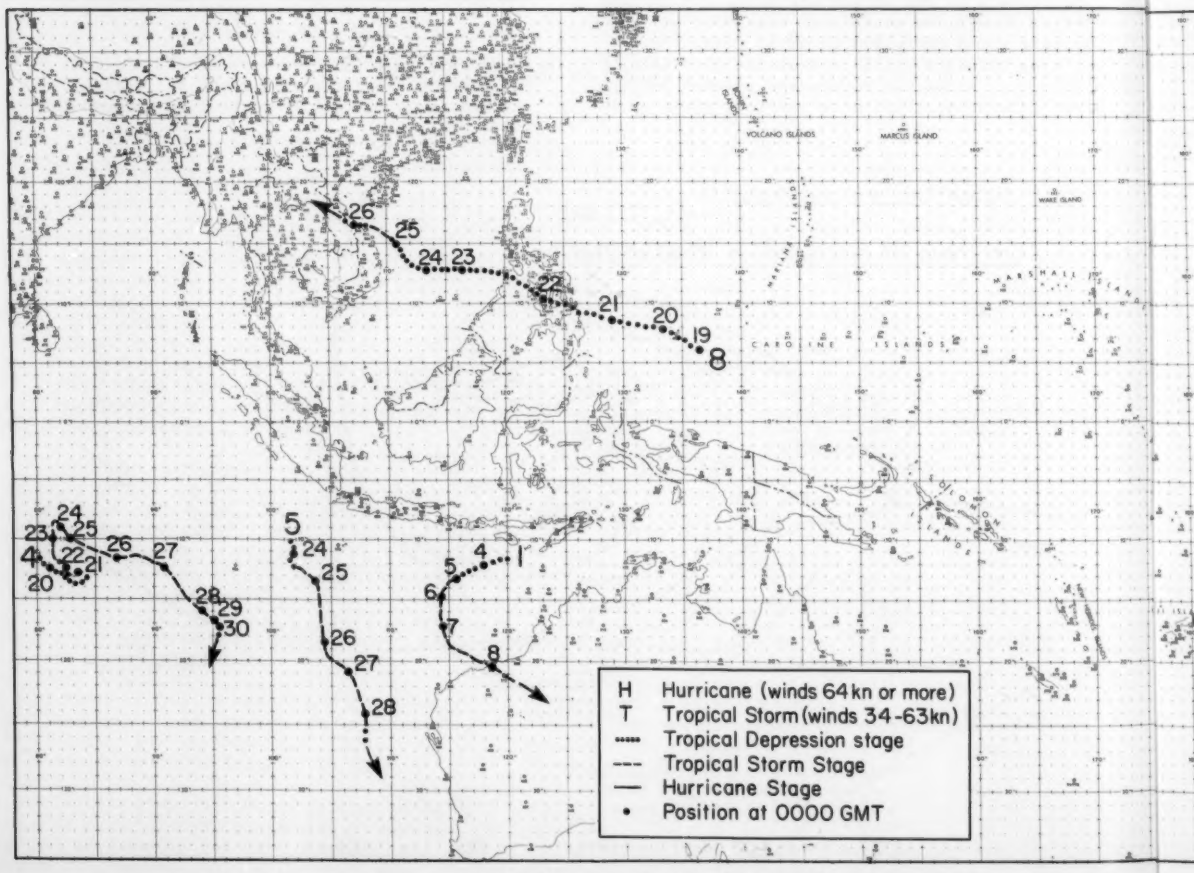


Figure 57.-- Tropical cyclone tracks for April, May, June 1983.

cyclone on record. He reached tropical storm strength later that day and attained hurricane intensity on the 19th about 70 mi southeast of Puka-Puka (fig. 61). William came within 60 mi of Hao before recurving to the southeast on the 20th. Maximum sustained winds reached 80 kn. On the 22d William dropped back to tropical storm strength as he headed east-southeastward.

TROPICAL CYCLONES--MAY 1983

Since 1966 just eight tropical cyclones, of which four reached hurricane intensity, have formed in May in the eastern North Pacific. This season hurricane Adolph became the tropics' only May cyclone when he came to life on the 21st. The below normal activity was due to a lull in the western North Pacific and North Indian Ocean.

Adolph, moving west-northwestward, reached hurricane strength late on the 23d just before crossing the 10th parallel. During the next few days he gradually turned toward the north. On the 24th, maximum sustained winds were estimated at 95 kn with gusts to 115 kn and the eye was, for a time, well defined. Adolph fell

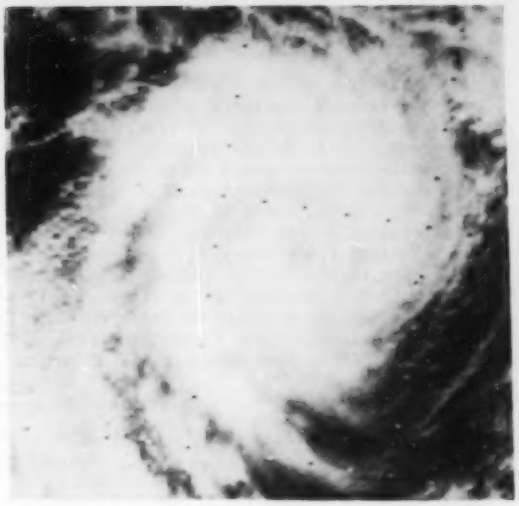
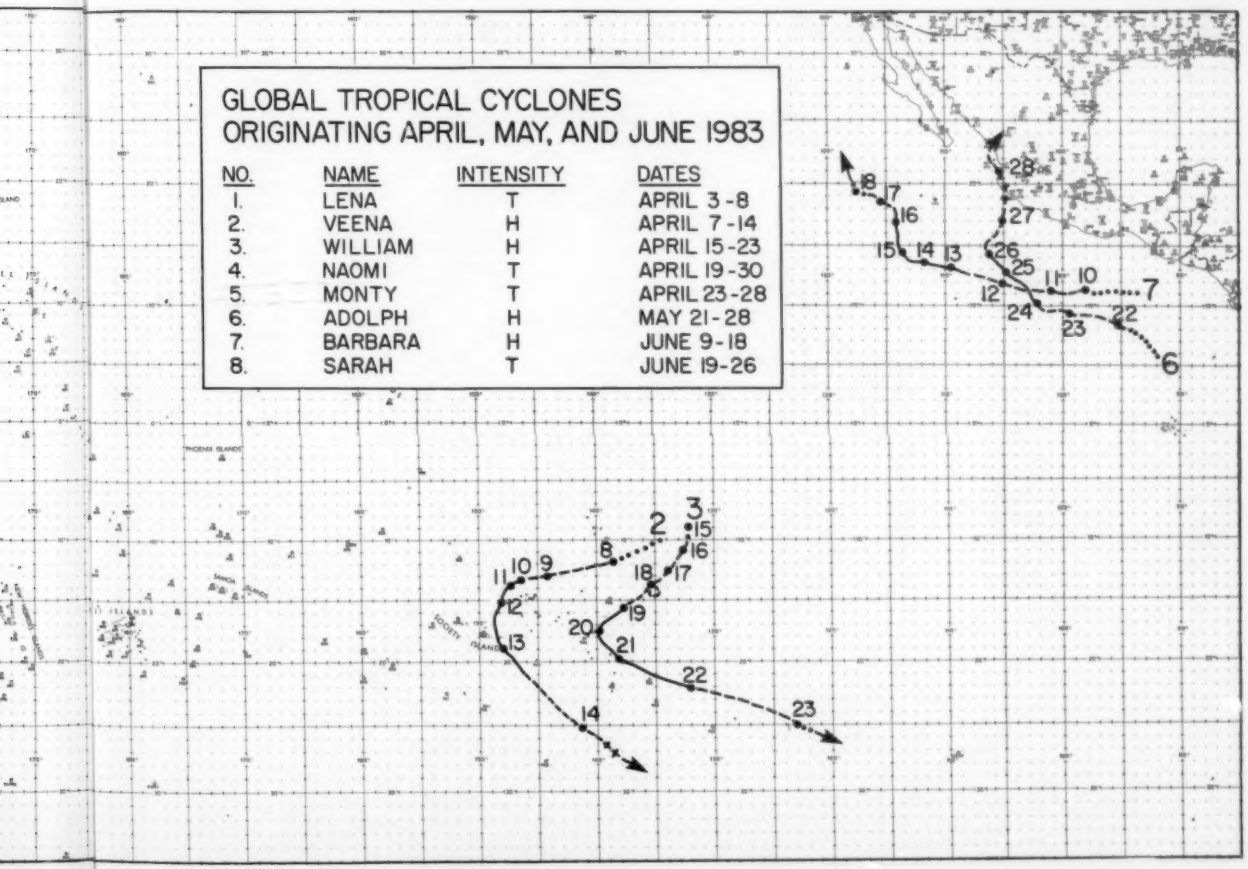


Figure 61.-- Hurricane William on the 19th. NOAA 7.


GLOBAL TROPICAL CYCLONES
ORIGINATING APRIL, MAY, AND JUNE 1983
NO. NAME INTENSITY DATES
1. LENA T APRIL 3-8
2. VEENA H APRIL 7-14
3. WILLIAM H APRIL 15-23
4. NAOMI T APRIL 19-30
5. MONTY T APRIL 23-28
6. ADOLPH H MAY 21-28
7. BARBARA H JUNE 9-18
8. SARAH T JUNE 19-26

1983.

to tropical storm strength on the 26th and turned toward the north-northeast. He made landfall just west of Manzanillo on the 27th.

TROPICAL CYCLONES--JUNE 1983

Just two tropical cyclones formed this month compared to a normal of four or five. Hurricane Barbara came to life in the eastern North Pacific while tropical storm Sarah got the western portion of the North Pacific off to one of its later starts. Back in 1973 the first tropical cyclone formed in July and this was the latest start since then.

Sarah came to life in the southern Philippine Sea on the 19th. She remained at depression strength for most of her life as she crossed the central Philippines and South China Sea. Finally on the 25th, just before running aground in Vietnam, maximum winds reached 35 kn. Hurricane Barbara formed about 250 mi southwest of Tapachula, Mexico on the 9th. Heading westward she intensified to tropical storm strength the following day. By the 12th Barbara reached hurricane intensity. She continued to intensify and by the 14th, 115-kn winds with gusts to 135 kn were roaring around what was described as a "fantastic eye." However, once across the 15th parallel the storm began to weaken and the eye filled. Barbara barely made it to the 20th parallel before dissipating.

TROPICAL CYCLONE WATCH--1983

Table 6 is a preliminary list of the global tropical cyclone that have occurred up till press time.

Table 6.--Tropical Cyclone Watch, 1983

Western North Pacific			
Sarah	Tc-1	T	June
Tip	Tc-2	H	July
Vera	Tc-3	H	July
Wayne	Tc-4	H	July
Abby	Tc-5	H	Aug.
Ben	Tc-7	T	Aug.
Carmen	Tc-6	T	Aug.
Dom	Tc-8	T	Aug.
Ellen	Tc-10	H	Aug.
Forrest	Tc-11	H	Sept.
Georgia	Tc-12	T	Sept.
Herbert	Tc-13	T	Oct.
Ida	Tc-14	H	Oct.
Joe	Tc-15	T	Oct.
Kim	Tc-16	T	Oct.

Australia-South Pacific			
Jane	07S-83	H	Jan.
Des	09S-83	T	Jan.
Mark	10S-83	H	Jan.
Namo	11S-83	T	Jan.
Elinor	13S-83	H	Feb.
Nisha	14S-83	H	Feb.
Oscar	15S-83	H	Feb.
Prema	16S-83	T	Feb.
Ken	17S-83	T	Feb.
Rewa	18S-83	H	Mar.
Sarah	19S-83	H	Mar.
Tomasi	20S-83	H	Mar.
Lena	21S-83	T	April
Veena	22S-83	H	April
William	23S-83	H	April
Monty	25S-83	T	April

Eastern North Pacific			
Adolph	Td-1	H	May
Barbara	Td-2	H	June
Cosme	Td-3	T	July
Dalila	Td-4	T	July
Erick	Td-5	T	July
Flossie	Td-6	T	July
Gil	Td-7	H	July
Henriette	Td-8	H	July
Ismal	Td-10	H	Aug.
Juliette	Td-12	T	Aug.
Lorena	Td-14	H	Sept.
Manuel	Td-15	H	Sept.
Narda	Td-16	T	Sept.
Octave	Td-17	T	Sept.
Priscilla	Td-18	H	Sept.
Raymond	Td-19	H	Oct.
Sonia	Td-20	T	Oct.
Tico	Td-21	H	Oct.

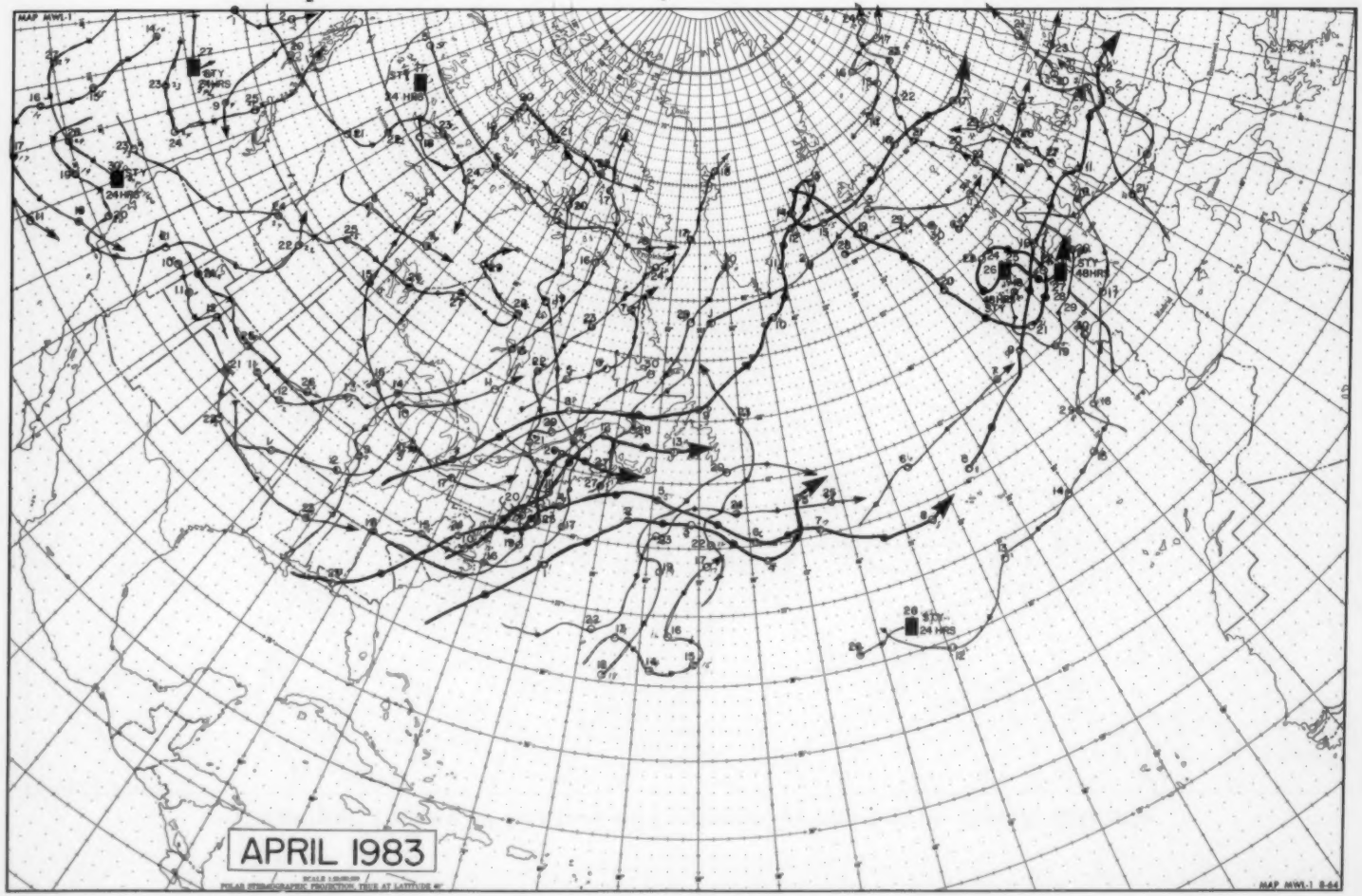
North Atlantic			
Alicia		H	Aug.
Barry		H	Aug.
Chantal		H	Sept.
Dean		T	Sept.

Central North Pacific			
Kiko	2c	H	Aug.

South Indian Ocean			
Elinah	8S-83	T	Jan.
--	12S-83	T	Feb.
Naomi	24S-83	T	April
TC 01S		T	July

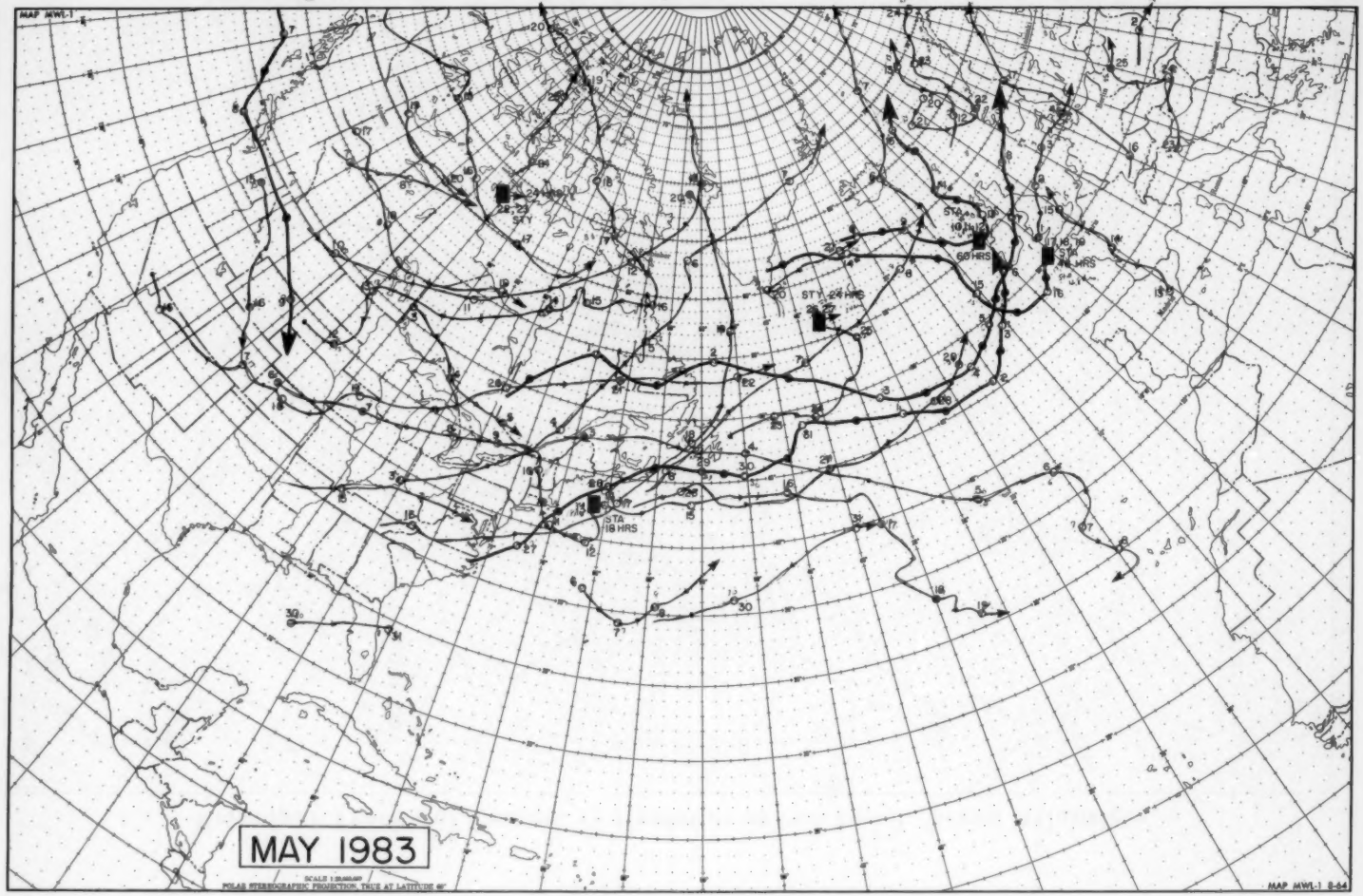
North Indian			
Aurora	01A	T	Aug.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

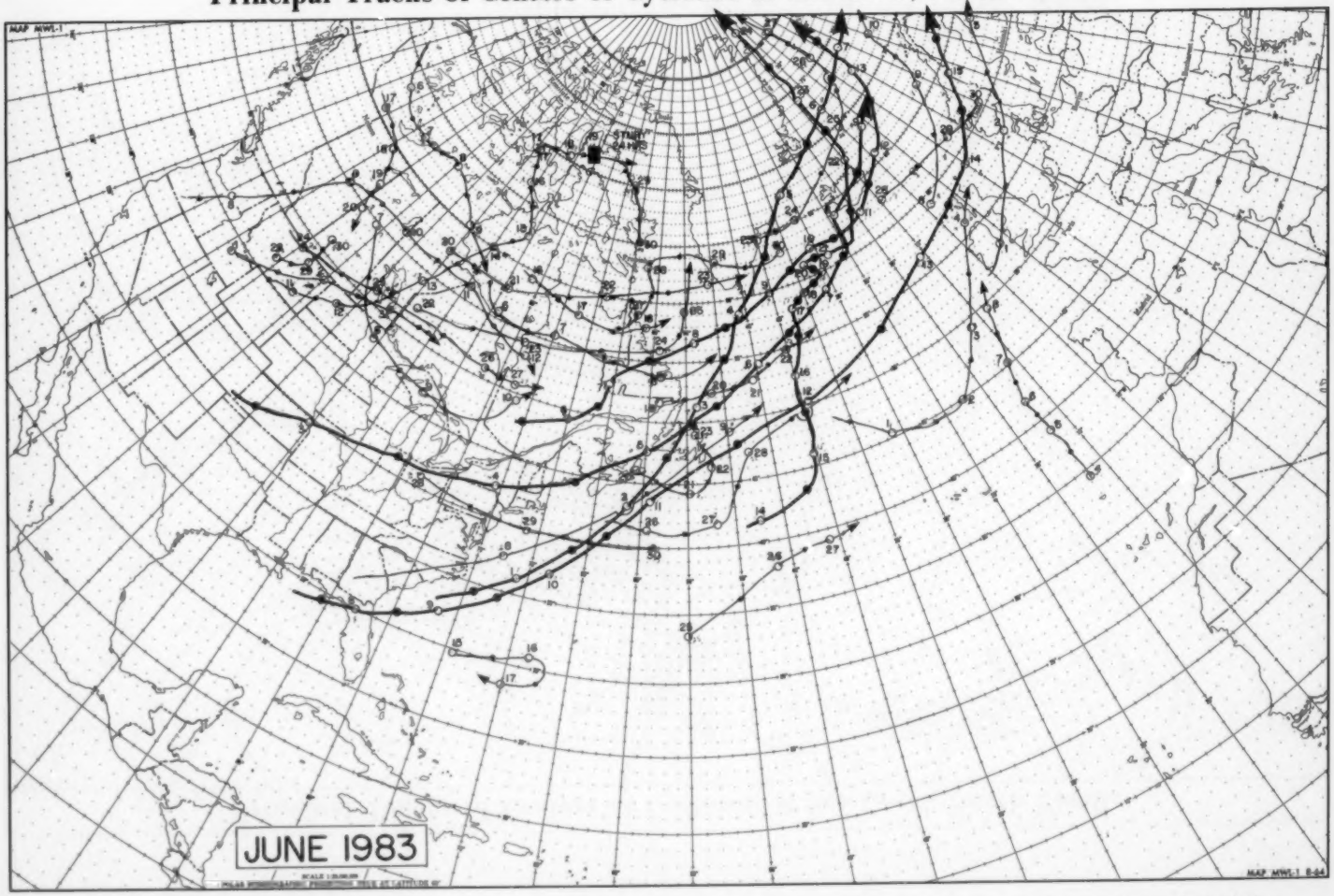
Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

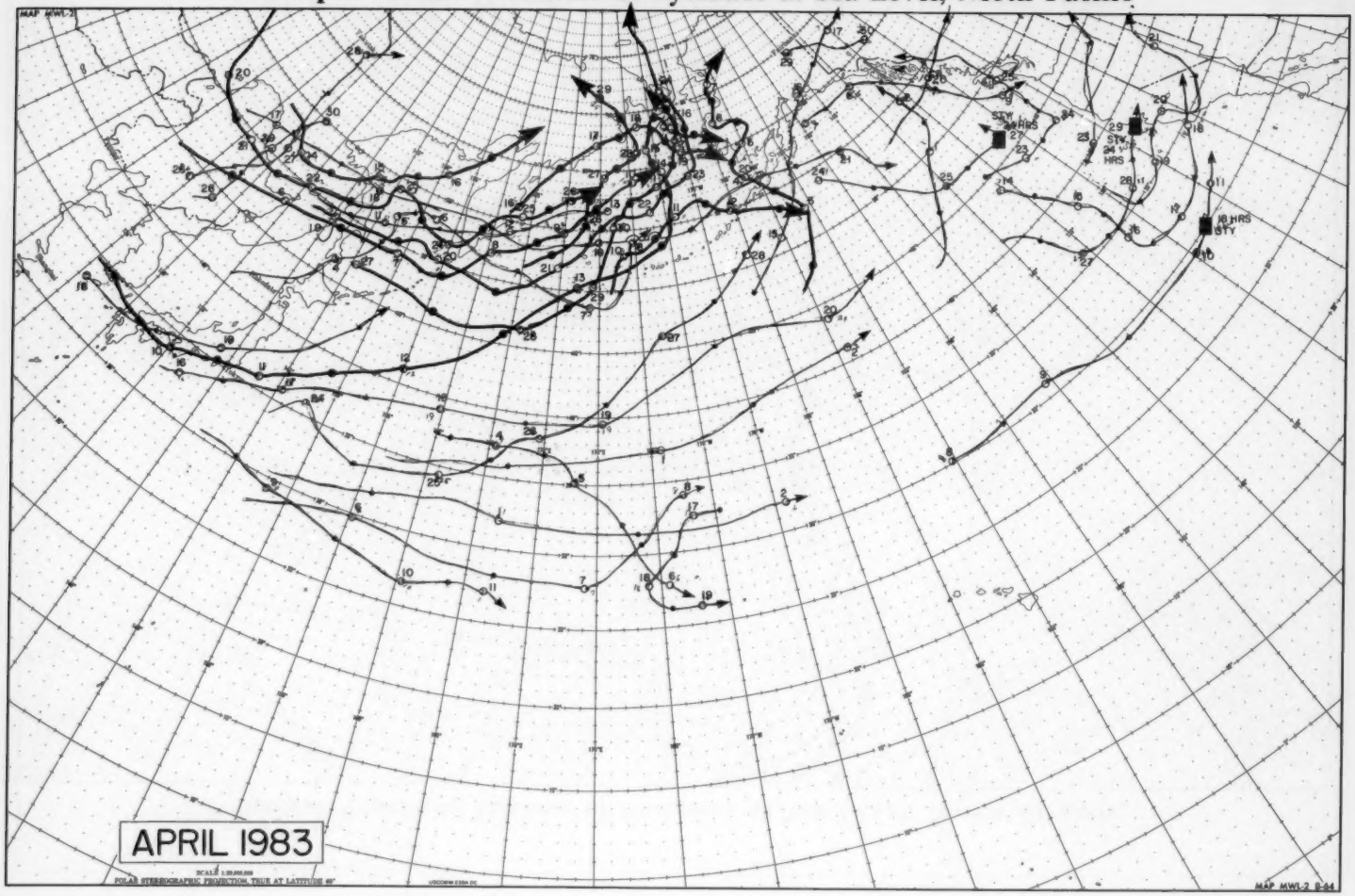
Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

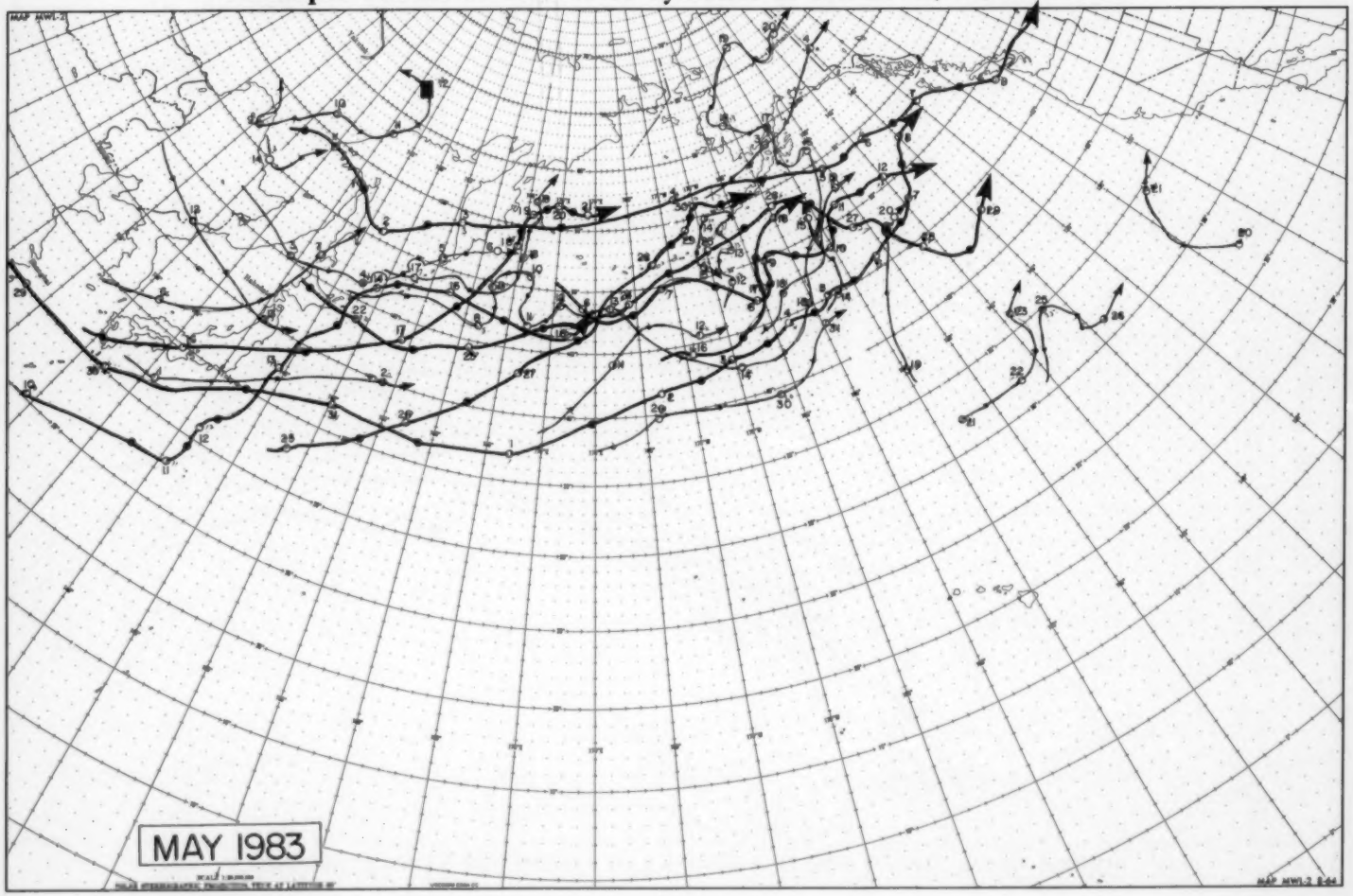
Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

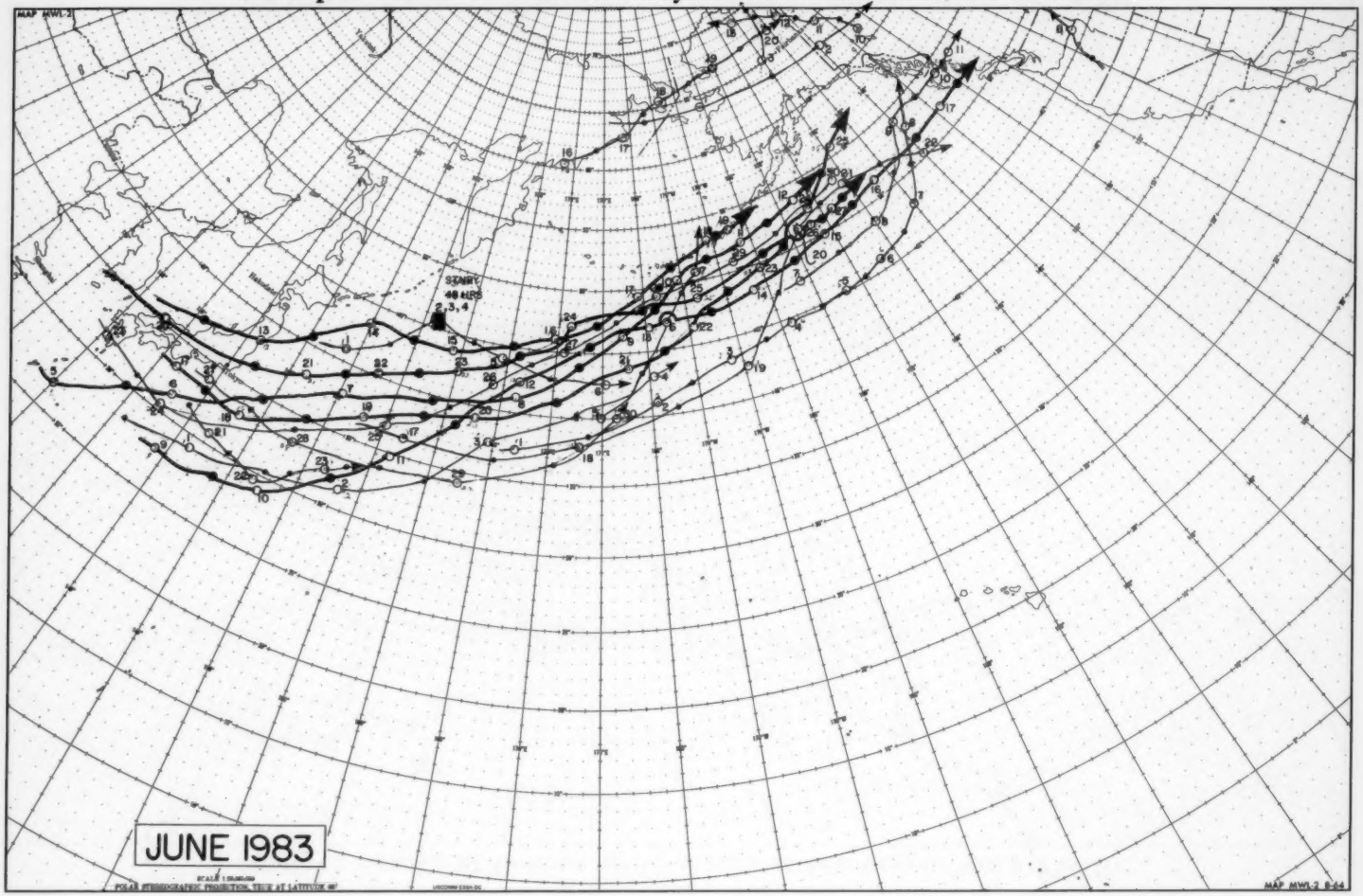
Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

North Atlantic Selected Gale and Wave Observations

April, May and June 1983

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10°	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C Air	Temperature °C Sea	Sea Waves* Period sec.	Sea Waves* Height ft.	Swell Waves Dir. 10°	Swell Waves Period sec.*	Swell Waves Height ft.
	ATLANTIC	APR.															
ALLTRANS EXPRESS	9VPU	1	35.6 N	71.4 W	00	13	M 55	2 NM	07	1003.5	16.0	21.5					
AMERICAN TRADER	KWKW	1	34.8 N	75.5 W	06	31	45	5 NM	02	1004.8	7.2	20.0	3	5	32	6	10
	CSDQ	1	38.5 N	65.5 W	18	18	40			0990.0	19.0	1.9	10	32.5			
ALBATROSS IV	WMVF	1	40.2 N	70.9 W	18	36	M 45	1 NM	61	1001.7	3.9	10.6	7	11.5	06	7	11.5
	NNBN	1	40.5 N	69.5 W	20	01	M 48	.5 NM	65	1001.0	3.5		3	8	01	3	19.5
ALLTRANS EXPRESS	9VPU	2	37.5 N	64.0 W	00	23	M 52	5 NM	07	0996.5	16.0	20.0					
	CSDQ	2	37.9 N	65.4 W	00	22	63	< 50 YD	82	0991.0	13.5	20.0	8	32.5			
BARBER TOBA	LMOE	2	40.8 N	60.3 W	00	14	M 45	.5 NM	64	0996.0	16.0		9	21			
ACADIA	ICDR	2	40.7 N	66.8 W	15	34	50	2 NM	62	1009.0	3.0	9.5	8	23	34	9	24.5
EXPORT FREEDOM	WCJS	7	42.4 N	47.0 W	12	05	M 45	5 NM	41	1001.0	15.0	17.8	4	10	05	8	13
TFL FREEDOM	9VXX	10	46.1 N	41.3 W	12	20	M 48	1 NM	81	1000.7	13.9	15.5	11	16.5	20	7	14.5
EDWARD RUTLEDGE	WFLH	12	42.7 N	39.6 W	00	03	M 34			1021.9	12.2	14.4	XX	16.5	XX	XX	29.5
	ELBF2	16	46.6 N	23.9 W	18	34	50	5 NM	02	1020.0	13.0						
	ELBF2	18	45.4 N	38.4 W	00	29	45	10 NM	01	1021.0	12.0						
MOBIL LUBE	WKIM	19	28.7 N	77.8 W	06	27	45	5 NM	62	1002.4	18.3	24.4	5	5	27	10	11.5
AMERICAN ACE	KFCV	21	49.0 N	21.3 W	06	36	45	10 NM	22	0999.0	10.0	11.1	8	19.5	36	8	19.5
USNS COMET TANK 7	NJZP	21	43.7 N	21.9 W	12	34	50	10 NM	18	1005.0	12.2	12.2	9	13	34	12	28
OGDEN THAMES	6ZDA	21	43.4 N	10.4 W	18	24	M 41	2 NM	21	0996.5	12.0	13.0	6	16.5	28	12	29.5
ROSINA TOPIC	ELAJ9	24	36.7 N	69.3 W	18	16	M 55			1001.0	20.0	26.0	6	16.5			
PANAMA	KPGL	24	32.6 N	78.7 W	18	16	48			1000.9	19.3	20.9	4	16.5	17	9	29.5
SAN JUAN	WRDD	24	32.2 N	78.7 W	18	17	40	2 NM	48	1003.4	20.6	20.6	7	24	18	12	29.5
	ELBJ3	25	36.1 N	70.9 W	00	18	M 45			0992.8	22.5	22.0	12	21			
ROSINA TOPIC	ELAJ9	25	35.2 N	65.5 W	06	16	M 45			0999.0	20.0	27.0	6	16.5			
OCEANIC	HOOE	25	33.8 N	65.9 W	06	18	M 55	2 NM	80	1002.4	21.1	20.8	6	16.5			
	KNCE	26	28.8 N	54.9 W	18	16	05	10 NM	03	1019.3	26.1	23.3	0	0	14	10	36
	KNCE	27	28.6 N	56.5 W	00	20	06	10 NM	02	1018.6	21.7	23.3	0	0	14	10	36
	ATLANTIC	MAY															
TRANSCOLUMBIA	KPGQ	3	41.8 N	35.9 W	18	24	50	5 NM	03	1008.9	14.5	17.3	10	19.5	24	9	16.5
ADM WM M CALLAGHAN	KGYE	4	44.3 N	39.1 W	00	32	50	10 NM	02	1011.0	11.7	16.2	4	11.5	29	8	19.5
AMERICAN ACCORD	KFEZ	4	47.1 N	29.2 W	12	36	25	10 NM	15	1000.0	11.7	13.4	4	10	28	11	19.5
AMERICAN ACCORD	KFEZ	7	41.5 N	53.2 W	00	28	50	5 NM		1020.0	20.0	20.6	5	19.5	18	12	19.5
AMERICAN ARCHER	KFCS	9	47.7 N	28.4 W	18	32	35	10 NM	02	1024.5	11.7	12.2	8	19.5	31	8	23
AMERICAN ACE	KFCV	9	49.1 N	14.5 W	18	29	40	10 NM	25	1007.0	10.6	12.2	11	21	31	12	29.5
AMERICAN ARCHER	KFCS	10	47.2 N	30.0 W	00	24	25	10 NM	02	1024.0	12.8	13.3	6	13	32	8	19.5
AMERICAN ACE	KFCV	10	49.4 N	07.7 W	12	25	35	10 NM	50	0992.4	10.0		8	16.5	29	15	28
ADM WM M CALLAGHAN	KGYE	13	47.5 N	29.6 W	00	34	35	10 NM	61	1013.2	9.4	14.4	5	13	35	6	19.5
TEXAS TRADER	KTMC	15	52.8 N	16.0 W	00	30	16	5 NM	60	0992.2	6.7	11.1	8	8	30	30	44
ALLTRANS ENTERPRISE	9VVD	15	48.2 N	17.3 W	12	31	M 45	1 NM	07	0985.1	7.8	10.4	9	16.5	31	13	19.5
AMERICAN LEGACY	KFGJ	15	49.3 N	19.5 W	18	31	40	10 NM	02	0995.0	10.0	12.2	10	13	30	13	16.5
AMERICAN LEADER	KFEJ	16	46.6 N	19.2 W	00	30	34	5 NM	16	1003.8	10.0	12.2	8	24.5	30	10	14.5
EXPORT FREEDOM	WCJS	16	37.1 N	19.8 W	12	31	40	10 NM	02	1021.5	16.7	15.0	5	8	32	7	10
CYGNUS	WSDF	16	48.4 N	17.0 W	18	34	42	5 NM	80	1000.5	12.2		5	13	32	7	16.5
CYGNUS	WSDF	17	47.7 N	20.2 W	06	33	45	10 NM	14	1013.2	11.1		5	13	32	7	14.5
AMERICAN EXPLORER	NTUG	18	40.6 N	09.7 W	06	32	13	10 NM	01	1020.5	13.4	15.6	3	5	32	11	26
	NNBN	18	40.5 N	69.5 W	17	01	M 40	10 NM		1033.0	13.5				01	3	3
AMERICAN EXPLORER	NTUG	19	47.0 N	07.0 W	06	28	19	10 NM	02	1010.5	11.7	13.4	2	3	29	8	29.5
TFL DEMOCRACY	9VPR	20	44.3 N	43.7 W	12	35	21	10 NM	02	1029.0	11.5	17.0	3	3	36	6	19.5
TRANSCOLUMBIA	KPGQ	22	40.7 N	63.7 W	00	21	40	5 NM	16	1022.0	20.0	20.0	5	8	21	8	10
EXPORT CHAMPION	WLCG	23	39.6 N	64.5 W	06	34	10	2 NM	12	1015.0	16.7	13.3	3	3	34	8	39
BUILDER	KEXB	24	43.0 N	43.1 W	18	27	40	10 NM	02	1008.3	13.4	18.3	4	13	29	6	10
BARBER TENNESSEE	LFEI	24	43.1 N	63.6 W	18	08	M 25	5 NM	02	1013.5	9.0	6.0	6	10	09	8	19.5
ALLTRANS ENTERPRISE	9VVD	25	43.1 N	26.5 W	18	18	M 45	1 NM	59	1012.9	16.0	14.5	5	13	18	6	12
	GR. LAKES	MAY															
PHILIP R CLARKE	WE3592	2	41.9 N	82.9 W	18	21	M 40	5 NM			16.0	3.0	0	5			
JOHN DYKSTRA	WE8451	9	45.1 N	82.8 W	06	04	M 41	10 NM	02		2.0	3.0	XX	8			
HERBERT C. JACKSON	WL3972	28	41.9 N	82.7 W	18	08	M 45	5 NM			19.0	22.0	4	5			
	ATLANTIC	JUNE															
USNS MOHAWK	NCRP	1	42.7 N	30.7 W	18	32	30	10 NM	01	1008.0	15.0	15.0	5	6.5	29	7	19.5
USNS MOHAWK	NCRP	2	42.5 N	31.3 W	00	34	23	10 NM	01	1012.5	14.4	15.6	5	10	29	7	19.5
ARGONAUT	KFDV	2	39.9 N	58.1 W	12	18	40	1 NM	15	1007.8	20.0	21.1	4	8	18	5	13
OVERSEAS ARCTIC	KLEZ	2	26.7 N	93.6 W	18	14	12	10 NM	02	1011.3	30.0	26.1	2	3	14	3	19.5
AMERICAN ARCHER	KFCS	3	49.4 N	14.5 W	12	17	M 20	5 NM	01	1007.0	13.9	13.3	5	5	21	10	19.5
HORNACARGO	WMPG	7	10.0 N	58.0 W	00	05	40	10 NM	02	1012.0	27.0	28.0	5	8	06	6	11.5
LYNCH T-AGOR 7	NEKF	13	59.5 N	06.0 W	06	22	M 22	10 NM	01	1006.0	11.1	6.1	8	6.5	22	12	21
AMERICAN LEGACY	KFGJ	13	49.3 N	15.5 W	12	22	30	5 NM	02	1014.2	14.4	14.4	7	19.5	22	6	18
AMCO VOYAGER	KADP	13	49.8 N	08.3 W	18	26	40	5 NM	02	1016.2	14.4	16.1	5	5	25	4	6.5
LYNCH T-AGOR 7	NEKF	14	56.2 N	07.3 W	06	30	M 30	10 NM	15	1013.0	11.1	6.7	4	6.5	30	8	21
AMERICAN ACE	KFCV	15	49.5 N	10.6 W	00	30	11	10 NM	02	1033.8	12.8	13.3	3	6.5	29	11	19.5
DELTA MAR	KICF	18	02.8 N	42.5 W	18	09	40	10 NM	04	1013.0	30.0	26.7	7	6.5	06	6	10
LASH PACIFICO	WIEE	30	39.2 N	63.9 W	06	34	25	10 NM	03	1011.0	22.2	25.0	7	16.5	34	35	19.5

\+ Direction of sea waves same as wind
X Direction or period of waves indeterminate
M Measured wind

NOTE: The observations are selected from those with winds ≥ 40 kn or waves ≥ 20 ft from April through September and 45 kn or 30 ft October through March.

Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

North Pacific Selected Gale and Wave Observations

April, May and June 1983

Vessel	Nationality	Date	Position of Ship Lat. deg.	Long. deg.	Time GMT	Wind Dir. 10°	Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C Air	Sea	Sea Waves* Period sec.	Height ft.	Swell Waves Dir. 10°	Period sec.*	Height ft.
	PACIFIC	APR.															
CRYSTAL STAR	DSTG	1	46.0 N	138.0 W	06	19	N 48	50 YD		0986.0	8.0	8.0	7	11.5	19	7	13
EASTERN WORLD	ELVA	1	38.8 N	145.0 E	23	36	N 51			1003.0	12.0	1.1	9	13	09	9	13
ASIA BRAVERY	A8CM	2	40.9 N	149.7 E	17	15	N 38	.25 NM	63	1007.0	8.0	3.0	8	23	15	9	36
PRESIDENT TYLER	WE2M	2	50.4 N	131.8 W	18	25	24	5 NM	25	1000.4	7.2	6.1	2	8	23	9	34.5
B T ALASKA	WF0E	3	40.1 N	125.6 W	06	27	45	10 NM		1025	10.4	13.3	6	11.5	27	7	13
PRESIDENT GRANT	WE2D	4	49.7 N	128.6 W	00	29	N 16	10 NM	02	1027.0	9.4	11.1	3	6.5	25	12	29.5
ALEUTIAN DEVELOPER	WIPL	4	56.2 N	157.4 W	00	11	N 48	5 NM		0978.1	3.8	3.9	6	14.5	15	8	19.5
OCTA	A8D6	4	49.2 N	132.9 W	06	28	N 16	5 NM	01	1030.6	11.0	4.0	7	16.5	27	13	29.5
EASTERN FRIENDSHIP	H8LR	4	54.4 N	165.4 W	06	31	N 45			0984.0	2.0	4.0	6	14.5	31	6	14.5
MING STAR	BLHV	8	35.4 N	154.3 W	06	03	N 50	1 NM	54	1015.5	10.0	13.0					
ROSE	6ZCJ	8	34.2 N	176.6 E	12	02	N 47	10 NM		1010.5	12.0	16.0					
SANTA MARIA	KAFC	8	37.9 N	83.0 W	12	10	10	10 NM	29	1007.1	27.8	30.0	7	1.5	10	8	29.5
ROSE	6ZCJ	9	33.0 N	175.7 E	00	01	N 47	1 NM	60	1014.0	13.5	16.0					
PRESIDENT GRANT	WE2D	9	48.5 N	158.7 E	18	32	N 45	5 NM	01	1010.0	0.6	2.2	7	14.5	31	7	13
	9VYW	11	46.1 N	157.9 W	18	18	25	.5 NM	24	1016.0	6.0	3.0	18	31	17	8	28
	9VYW	12	45.6 N	154.4 W	06	18	23	.25 NM	24	1013.0	6.0	4.0	18	32.5	17	7	23
	DZPT	13	53.5 N	177.0 W	12	23	60	1 NM		1002.0	4.0	2.0	7	14.5	27	7	16.5
PRESIDENT TYLER	WE2M	13	41.2 N	161.2 W	18	30	28	10 NM	02	1026.8		7.8	6	10	31	10	31
	9VYW	15	40.2 N	132.9 W	06	07	13	5 NM	24	1012.0	10.0	3.0	6	6.5	30	28	32.5
	DZPT	15	49.1 N	166.7 E	18	33	47	1 NM	85	1018.0	3.0	1.0	5	5	33	7	8
MING MOON	BLMO	15	34.8 N	175.9 W	23	02	N 53	1 NM	62	1011.0	12.0	13.0	7	13	03	8	19.5
GOLDEN DAISY	6ZS6	16	35.7 N	141.3 E	02	36	N 49	1 NM	12	1008.0	18.5	14.0	3	10	21	5	11.5
	DZPT	16	47.9 N	162.5 E	18	18	47	< 50 YD	12	1012.0	4.0	1.0	3	8	29	6	14.5
SAMUEL S	SLHX	17	45.5 N	171.1 E	00	20	N 45	.25 NM	95	1020.0	7.0	3.0	9	23	21	9	23
	DZPT	17	45.9 N	160.3 E	06	23	47	1 NM	10	1025.0	8.0	1.0	3	13	29	6	14.5
	JEUS	19	50.4 N	179.8 W	18	25	N 47	200 YD		0994.5	4.0	4.0	4	10	25	8	21
	WNRD	22	39.7 N	175.8 E	12	33	45	5 NM	02	1024.0	7.8	9.4	6	8	34	8	11.5
QUATSINO SOUND	ELAW9	27	35.7 N	128.4 W	06	17	N 28	10 NM	02	1002.0	13.0	15.0	11	29.5	17	12	31
JAPAN RAINBOW	JPVJ	27	32.1 N	129.1 W	06	18	N 15	5 NM	01	1011.2	16.0	16.0	5	6.5	19	19	29.5
QUATSINO SOUND	ELAW9	29	38.7 N	131.5 W	18	15	N 24	10 NM	02	1008.0	14.0	14.0	10	28	15	11	31
QUATSINO SOUND	ELAW9	30	36.3 N	135.3 W	12	18	N 25	10 NM	02	1015.0	13.0	12.0	9	31	18	10	32.5
	PACIFIC	MAY															
MAIN EXPRESS	3EE0	1	37.3 N	128.2 W	00	34	N 23	10 NM	02	1015.0	14.0	13.0	6	11.5	35	10	19.5
QUATSINO SOUND	ELAW	1	36.6 N	139.7 W	06	03	N 27			1025.0	12.0	12.0	8	26	03	10	29.5
PRESIDENT GRANT	WE2D	1	46.2 N	168.2 E	06	26	N 15	10 NM	02	1023.0	4.0	4.0	3	8	04	12	29.5
MOMSING BREEZE	3EOU	1	54.0 N	171.3 W	12	20	43			1003.0	4.0	5.0	9	14.5	20	12	19.5
ALEUTIAN DEVELOPER	WIPL	1	54.5 N	163.7 W	18	20	N 21	5 NM	03	1011.0	5.0	6.7	12	13	22	13	19.5
	D9IN	3	48.6 N	173.2 E	08	14	N 45	200 YD	21	1013.0	4.0	2.0					
TONCI TOPIC	ELKX	4	49.3 N	162.1 E	00	27	41	2 NM	32	1013.0	3.0	3.0	7	11.5	24	7	10
MOMSING BREEZE	3EOU	4	51.7 N	168.6 E	06	25	35	2 NM	50	1009.0	4.0	4.0	8	14.5	25	10	19.5
GARDENIA	A8UA	5	52.9 N	167.3 W	06	29	N 47	2 NM		1003.0	6.0	5.0	3	13	28	7	16.5
SEALAND ENDURANCE	K8JX	5	49.9 N	168.8 W	06	28	N 33	10 NM	03	1015.0	9.4	3.0	5	10	28	10	19.5
TONCI TOPIC	ELKX	5	46.1 N	153.0 E	12	28	45	2 NM	25	1009.5	3.0	2.0	8	11.5			
PRESIDENT HOOVER	WTST	5	54.2 N	163.5 W	12	36	N 40	5 NM	02	1013.0	1.2	6.1					
SEPTA	A8JB	5	54.1 N	163.8 W	18	30	N 37			1007.7	4.0	5.0	5	11.5	30	6	8
GARDENIA	A8UA	6	54.2 N	162.0 E	00	32	N 30	5 NM	02	1010.0	8.0	5.0	5	19.5	33	5	19.5
MOMSING BREEZE	3EOU	6	47.5 N	157.6 E	06	29	40	2 NM	50	1013.1	1.5	2.0	8	19.5	29	10	29.5
SEALAND ENDURANCE	K8JX	6	50.2 N	159.8 W	12	31	N 28	10 NM	03	1015.0	5.6	5.0	5	5	32	7	29.5
CLIFFORD MAERSK	OXZH	6	50.8 N	155.9 W	18	30	40	10 NM	02	1011.0	4.6		6	16.5	29	8	23
ASIA BRAVERY	A8CM	6	05.4 N	175.5 E	23	00	N 15	10 NM	01	1012.5	30.0	29.0	6	11.5	08	8	19.5
TONCI TOPIC	ELKX	7	42.1 N	144.1 E	00	14	48	.25 NM	27		9.0	2.0	6	8			
PRESIDENT JEFFERSON	WP0E	7	35.1 N	177.5 W	06	18	40	2 NM		1014.8	16.7	12.3	4	10	18	8	13
ASIA BRAVERY	A8CM	7	07.3 N	176.8 E	11	05	N 24	5 NM	03	1012.5	28.0	28.0	6	14.5	06	9	19.5
MOMSING BREEZE	3EOU	7	44.7 N	150.6 E	12	13	25	.5 NM	02	0998.0	3.5	2.0	6	13	14	6	21
QUATSINO SOUND	ELAW	7	36.7 N	179.8 W	12	30	N 24	10 NM	04	1013.0	14.0	14.0	6	19.5	30	8	19.5
SEALAND LIBERATOR	KHRP	7	35.1 N	141.8 E	18	24	N 32			1004.0	21.0	16.0	8	19.5	21	12	19.5
QUATSINO SOUND	ELAW	8	36.8 N	176.4 E	06	28	N 28	10 NM	04	1015.0	12.0	14.0	10	28	28	9	29.5
GLOBAL FRONTIER	H3AU	8	38.6 N	163.1 W	18	25	N 15	10 NM	03	1007.0	13.0	12.0	7	19.5	25	7	19.5
	S6FA	8	41.1 N	153.2 W	22	17	N 41	5 NM	07	1014.0	11.0	9.0	8	8	19	13	13
	D9XX	9	43.8 N	162.4 W	00	28	N 20	10 NM	02	0998.0	10.0	8.0	6	10	19	10	19.5
QUATSINO SOUND	ELAW	9	36.5 N	172.6 E	00	26	N 25	5 NM	04	1015.0	16.0	14.0	10	28	26	9	29.5
	A8F0	9	43.0 N	175.0 W	06	32	N 24	10 NM		1009.0	5.0	6.0	12	14.5	32	14	19.5
ASIA BRAVERY	A8CM	9	14.0 N	177.4 W	11	07	N 20	10 NM	03	1015.0	27.0	27.0	6	13	07	8	19.5
	D5MC	9	54.1 N	156.0 W	12	14	N 18	.25 NM	58	1006.0	5.0	6.0	9	18	14	10	19.5
	D5AN	9	46.9 N	125.8 W	12	36	N 22	2 NM	81	1018.5	10.0	13.0	20	16.5	35	16	21
GLOBAL FRONTIER	H3AU	9	39.0 N	167.7 W	18	28	N 30	5 NM	03	1010.5	11.0	12.0	9	26	28	9	26
GLOBAL FRONTIER	H3AU	10	39.1 N	168.6 W	00	29	N 18	10 NM	03	1014.2	13.0	12.0	8	23	29	8	23
B T SAN DIEGO	WSVR	10	36.7 N	122.8 W	00	32	40	10 NM	02	1017.0	13.3	12.2	5	11.5	33	8	11.5
MAYA PIONEER	H9TM	10	52.8 N	146.1 W	12	13	N 32	2 NM	62	1012.0	6.5	3.0	9	19.5	13	9	19.5
B T SAN DIEGO	WSVR	11	31.0 N	118.2 W	06	31	30	10 NM	02	1015.5	13.9	14.4	5	8	31	8	19.5
	D5MC	11	54.0 N	174.4 W	12	22	N 25			1003.0	3.0	5.0	9	21	26	10	21
GLOBAL FRONTIER	H3AU	11	39.9 N	178.8 W	18	23	N 25	2 NM		1005.0	12.0	10.0	6	23	23	8	23
AMERICAN LARK	WZJF	11	39.7 N	164.2 E	18	33	25	10 NM	16	1016.7	6.7	10.6	12	19.5	33	12	16.5
MAYA PIONEER	H9TM	12	54.0 N	158.8 W	00	03	N 50	1 NM	41	1013.0	13.5	1.0	3	5	03	4	3
EXXON PHILADELPHIA	WNFJ	12	55.6 N	139.9 W	18	12	N 24	5 NM	02	1017.6	11.4	7.8	3	13	12	6	19.5
SAMOA	6XTZ	13	28.9 N	128.2 W	00	12	N 43			1004.5	19.0	22.0	6	6.5	10	8	10
GLOBAL FRONTIER	H3AU	13	40.7 N	171.0 E	18	32	N 25	10 NM	03	1022.0	8.0	12.0	8	19.5	32	8	19.5
MANUKAI	A8F0	14	38.4 N	150.3 E	06	25	N 30	5 NM		1003.0	18.0	12.0	14	13	02	16	23
	KNLO	14	37.3 N	124.2 W	06	36	N 21	5 NM	03	1017.0	12.8	14.4	4	6.5	28	6	23
	D5MC	14	47.9 N	158.8 E	18	11	N 43	.25 NM	20	0997.0	3.0	2.0	15	21	13	12	29.5
ANNA MAERSK	OYK5	15	44.6 N	165.9 E	00	15	40	200 YD	59	1004.0	7.8						
DISCOVERER 055	WYEA	15	37.5 N	123.4 W	06	32	N 44	5 NM		1020.7	12.3	12.4	6	13	33	7	13
	D5MC	15	46.3 N	155.4 E	12	27	N 22	200 YD		0991.0	2.0	1.0	15	23	28	15	23
GLOBAL FRONTIER	H3AU	15	41.7 N	159.7 E	18	24	N 30			1002.7	10.0	8.0	9	23	26	9	23
ASIA BRAVERY	A8CM	15	36.9 N	151.8 W	23	23	N 22	50 YD		1019.0	17.0	17.0	5	11.5	22	9	19.5
SAMUEL S	SLHX	16	45.5 N	146.3 W	00	16	N 40	200 YD		1012.5	9.0	8.0	7	13	16	8	13
	D5MC	16	45.0 N	153.6 E	00	29	N 38	.25 NM		1006.0	2.0	1.0	16	23	29	16	23
GLOBAL FRONTIER	H3AU	16	41.8 N	158.3 E	06	27	N 38	5 NM	03	1009.0	8.5	8.0	10	26	27	9	29.5
MING GLORY	BLMX	16	42.0 N	164.5 W	18	17	N 25	1 NM	62	0997.5	9.0	7.0	7	19.5			
MOBIL ARCTIC	KSPY	16	59.6 N	145.4 W	18	09	50	2 NM	91	1017.5	8.5		3	10	09	5	13
CLIFFORD MAERSK	OXZH	16	38.3 N	150.6 E	18	15	40	2 NM	65	1008.0	14.4		6	16.5			
BARBER TOBA	LMOE	17	36.7 N	142.7 E	00	21	N 25	5 NM	03	1000.0	24.5	22.5	10	23	21	12	23

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind		Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C		Sea Waves*		Swell Waves	
			Lat. deg.	Long. deg.		Dir. 10°	Speed kt.				Air	Sea	Period sec.	Height ft.	Dir. 10°	Period sec.*	Height ft.
		MAY															
SEALAND PATRIOT	KHRF	17	42.6 N	150.3 E	05	07	M 44	.5 NM	63	0990.8	4.0	1.0	6	14.5			
ASIA HERON	ABOD	17	34.7 N	142.7 E	06	23	M 50	5 NM	29	1003.0	23.0	23.0	10	11.5	24	14	14.5
MING GLORY	BLHX	17	42.0 N	159.3 W	06	17	M 25	1 NM	60	1000.5	11.0	11.0	8	23	09	11	16.5
	OSMC	17	40.7 N	147.4 E	06	24	M 30	50 YD		0986.0	13.0	11.0	15	21	21	15	21
HOEGH CLIPPER	LICS	17	35.7 N	170.6 E	06	33	M 27	5 NM	80	1014.0	14.0		12	19.5			
GLOBAL FRONTIER	H3AU	17	42.2 N	151.6 E	12	21	M 40	5 NM	07	0986.5	8.5	9.0	8	19.5	21	9	18
	HPOP	17	37.3 N	125.2 W	18	35	M 27	5 NM	03	1023.0	13.0	14.0	12	13	35	12	19.5
MING GLORY	BLHX	18	41.3 N	148.5 W	06	18	M 25			1021.0	13.0	11.0	10	16.5	18	10	19.5
GLOBAL FRONTIER	H3AU	18	42.5 N	147.6 E	06	21	M 17	10 NM	03	1006.0	10.5	9.0	6	14.5	21	9	19.5
	HPOP	18	36.6 N	126.8 W	06	35	M 27	10 NM	02	1026.5	12.0	14.0	12	13	35	13	19.5
	JEUS	18	47.4 N	167.2 E	06	20	M 42	50 YD		0993.0	5.5	3.5	4	10	17	6	13
ORIENTAL EXECUTIVE	D5AN	18	51.0 N	165.1 E	18	25	M 33	2 NM	07	0988.0	5.0	7.0	10	21	25	16	24.5
ORIENTAL EXECUTIVE	D5AN	19	49.5 N	162.0 E	06	25	M 38	5 NM		0996.0	5.5	7.0	10	19.5	24	17	18
ATIGUN PASS	KSFJ	19	40.4 N	126.6 W	18	34	35	10 NM	02	1022.7	14.4	12.6	4	14.5	34	10	19.5
PRESIDENT GRANT	WE2D	19	52.6 N	176.5 E	18	20	M 15	10 NM	02	1004.0	3.3	4.0	2	5	24	8	19.5
MING GLORY	BLHX	20	37.0 N	129.2 W	06	01	M 27	5 NM	02	1020.0	14.0	16.0	XX	19.5	05	10	16.5
	KGBA	20	55.7 N	139.6 W	06	26	40	2 NM	62	1010.0	7.2	9.5	4	6.5	26	8	10
PRESIDENT GRANT	WE2D	20	51.2 N	170.8 E	06	24	M 23	10 NM	03	1001.0	6.4	4.0	4	6.5	24	10	23
SOHIO INTREPID	KACK	20	42.9 N	126.7 W	23	01	40			1021.5	13.2	12.7	10	23			
PRINCE WILLIAM SOUND	WSDX	21	42.0 N	127.5 W	00	04	35	5 NM	07	1020.0	15.9	15.3	5	10	02	8	19.5
SOHIO INTREPID	KACK	21	46.2 N	129.3 W	12	33	40	5 NM	12	1025.0	10.4	13.4					
SEALAND LIBERATOR	KHRP	23	47.1 N	169.2 E	12	09	M 44	1 NM	63		5.0	2.0	8	16.5	09	9	16.5
ARCO CALIFORNIA	WMCV	24	17.9 N	103.4 W	21	12	M 28	5 NM	03	1006.3	29.5	28.9	2	5	14	9	19.5
SKOUBORD	LIGN	26	36.2 N	142.4 E	00	02	40	2 NM	81	1014.5	13.6	23.0	6	6.5	05	5	13
PRESIDENT JEFFERSON	WPGE	26	34.6 N	150.2 E	00	03	55	2 NM	63	1003.0	15.4	17.4	3	6.5	03	8	18
EXXON PHILADELPHIA	WNFJ	26	57.3 N	141.9 W	18	11	M 32	10 NM	03	1005.6	8.3	7.6	3	16.5	11	4	19.5
	S6GY	27	36.9 N	156.0 E	00	17	M 35	1 NM	40	1004.5	19.5		9	14.5	18	14	19.5
MOBILE MERIDIAN	KGSM	27	58.5 N	143.4 W	06	09	30	5 NM	07	1004.0	9.2	8.2	6	13	12	8	21
	WLPP	27	25.6 N	114.3 W	15	32	15	10 NM	02	1009.8	18.3	18.9	11	10	14	14	26
EXXON NORTH SLOPE	KHLQ	28	51.4 N	135.9 W	00	15	M 37	2 NM	51	1006.2	13.0	7.8	6	19.5			
HOHSING BREEZE	3EOU	31	53.3 N	149.6 W	06	09	30	.5 NM	11	1000.0	9.0	8.0	9	13	09	13	19.5
	PACIFIC	JUNE															
EASTERN DIAMOND	HODT	1	49.1 N	126.5 W	00	30	M 31	5 NM	02	1009.5	12.5		12	16.5	30	14	19.5
AXEL MAERSK	OXSF	1	37.7 N	125.0 W	00	32	37	10 NM	01	1014.0	15.5	13.0	7	19.5			
PACIFIC VENTURE	HOVS	1	50.6 N	134.0 W	12	33	M 29	5 NM		1018.0	11.0	7.0	11	19.5	33	14	24.5
	HGSM	2	50.4 N	129.5 W	00	31	27	10 NM	02	1011.9	12.0	11.6	4	5	32	7	19.5
PACIFIC VENTURE	HOVS	2	52.4 N	142.6 W	12	30	M 29	5 NM		1020.0	10.0	4.0	9	16.5	30	10	19.5
ORIENTAL EXECUTIVE	D5AN	3	29.1 N	127.7 E	00	11	M 44	.25 NM	21	0994.0	23.0	28.0	7	32.5	13	17	37.5
PACIFIC VENTURE	HOVS	3	53.6 N	151.9 W	12	27	M 16	5 NM	60	1012.0	9.0	3.0	9	14.5	27	10	19.5
	SMKM	3	41.0 N	158.4 W	18	18	M 41	.25 NM	44	1006.5	15.0	11.0	8	13	17	9	11.5
MAIN EXPRESS	3EED	4	41.7 N	167.6 W	00	23	M 28	1 NM		0998.0	11.0	11.0	4	6.5	21	12	26
	SMKM	4	40.8 N	156.3 W	00	19	M 40	.25 NM	44	1008.8	13.5	12.0	10	14.5	16	8	11.5
EXXON PHILADELPHIA	WNFJ	4	42.0 N	127.0 W	00	36	M 30	5 NM	00	1027.0	16.7	12.8	4	19.5	33	6	21
STAR CARRIER	D5MC	4	49.9 N	148.2 W	06	09	M 51			1016.0	8.0	6.0	13	18	09	13	18
ARCO SAG RIVER	WLDF	4	40.0 N	153.8 W	18	18	M 40	2 NM	81	1010.8	16.1	10.6	3	11.5	19	5	14.5
MAIN EXPRESS	3EED	5	41.7 N	153.2 W	12	21	M 57	5 NM	02	1009.0	12.0	14.5					
TYSON LYNES	WSCJ	5	39.1 N	155.6 W	12	25	28	10 NM	25	1010.0	14.4	12.2	6	10	27	8	19.5
	BLHZ	5	37.0 N	129.1 W	18	03	M 22			1026.0	14.0	15.0	7	13	01	8	24.5
	3FPJ	5	51.8 N	172.0 W	21	11	M 34	200 YD		1020.0	8.0	5.0	10	16.5	11	12	19.5
	3FMV	6	45.5 N	170.0 W	00	14	M 14	5 NM		1014.0	7.5	8.0	6	3	05	13	19.5
MAIN EXPRESS	3EED	6	40.7 N	143.9 W	12	19	M 40	5 NM	60	1018.5	13.5	16.0					
	3FPJ	6	50.4 N	166.2 W	21	09	M 34			1014.5	7.0	5.0	12	18	09	12	19.5
ORIENTAL EXECUTIVE	D5AN	9	41.1 N	161.3 E	00	31	M 23	5 NM		1008.0	11.0	11.0	6	13	02	18	19.5
ARCO FAIRBANKS	WGWB	9	41.9 N	126.5 W	06	23	40	10 NM		1016.1	13.0	12.0					
AMERICAN LYNX	WZJE	9	19.4 N	127.4 E	06	18	10	10 NM	02	1014.0	32.8	28.9	2	3	18	18	29.5
	DZPH	10	40.7 N	169.6 E	06	27	M 33	2 NM	60	1010.0	10.0	13.0	8	23	27	8	23
SEPTA	A8JO	12	41.9 N	161.3 E	12	34	M 42	50 YD	40	1002.8	5.0	8.0	7	23	02	7	23
SEPTA	A8JQ	13	43.2 N	164.5 E	06	33	M 24			1015.5	8.0	7.0	6	18	33	6	19.5
LEDA MAERSK	OULU	13	46.7 N	179.3 E	06	11	30	1 NM	81	0989.6	8.4		10	19.5			
CLIFFORD MAERSK	OXZH	13	42.6 N	171.0 E	06	29	47	1 NM	58	1005.0	8.0	8.0	6	23	27	6	23
B T ALASKA	WFQE	13	47.4 N	132.1 W	06	14	40	5 NM		1012.5	12.8	11.7	6	10	14	8	13
CALIFORNIA RAINBOW	JNJL	13	35.4 N	143.0 E	09	18	M 42	2 NM	05	0999.0	21.0	22.5	7	8	19	11	11.5
HOEGH CAIRN	LICX	13	41.4 N	175.5 W	18	25	45	2 NM		1003.5	11.0						
	8HOM	14	44.1 N	153.1 E	06	09	M 44	1 NM	80	1002.6	6.0						
	H3YD	14	39.8 N	171.0 W	06	26	M 42			1007.0	13.0	13.0	5	8	26	6	8
HOEGH CAIRN	LICX	14	41.8 N	171.7 W	06	25	48	2 NM		0999.6	13.0						
CLIFFORD MAERSK	OXZH	14	40.0 N	179.8 E	06	29	30	.5 NM	81	1014.0	9.2		6	16.5	29	6	19.5
OGDEN THAMES	6ZDA	15	37.6 N	163.9 W	00	26	M 35	5 NM	16	1011.0	17.0	16.0	2	19.5	26	6	19.5
MAIN EXPRESS	3EED	15	50.4 N	130.8 W	06	25	M 37	2 NM	81	1007.0	11.0	16.0	8	14.5	20	10	19.5
CHARLOTTE MAERSK	OYIU	15	37.6 N	168.4 W	06	29	25	5 NM	81	1016.0	13.3	14.0	6	11.5	30	10	24.5
MAIN EXPRESS	3EED	16	52.1 N	133.3 W	00	17	M 23	1 NM		1004.5	10.6	14.0	7	13	16	13	19.5
OGDEN THAMES	6ZDA	16	37.2 N	168.1 W	00	26	M 15	10 NM	02	1022.5	17.5	14.0	2	6.5	26	10	19.5
PRESIDENT GRANT	WE2D	16	49.8 N	137.5 W	12	20	M 26	10 NM	02	0999.0	10.4	10.0	4	6.5	23	10	19.5
PRESIDENT GRANT	WE2D	17	49.3 N	131.0 W	00	16	M 40	2 NM	81	1003.0	13.0	11.0	5	19.5	22	10	23
PACIFIC VENTURE	HOVS	17	40.1 N	152.0 E	06	09	M 40	.5 NM	27	1009.0	15.0	8.0	8	16.5	07	8	14.5
	ELVT	19	35.0 N	123.0 W	00	04	M 43	5 NM	07	1020.0	18.0	16.0	8	14.5	04	15	18
DELTA MAR	KICF	19	01.2 N	90.1 W	06	09	40	10 NM	00	1013.4	26.1	26.7	7	6.5	08	5	8
CHEVRON WASHINGTON	KFDB	20	38.3 N	124.1 W	12	33	M 40	10 NM	03	1012.0	14.0		5	8	30	6	17
OGDEN THAMES	6ZDA	21	36.9 N	164.9 E	00	33	M 40	2 NM	50	1010.5	14.0	14.0	4	10	34	14	14.5
PRESIDENT MONROE	WNRD	21	50.1 N	157.1 W	06	28	M 40	5 NM	02	1001.2	8.3	6.1	6	11.5	28	6	11.5
SEALAND ENDURANCE	KGJX	21	45.3 N	171.9 W	18	16	M 33	.5 NM	47	1007.7	10.6	7.0	6	10	16	XX	19.5
SEALAND ENDURANCE	KGJX	22	45.4 N	174.7 W	00	22	M 40	.5 NM	42	0991.2	8.9	7.0	5	10	22	8	24.5
ANNA MAERSK	OYKS	22	49.1 N	153.9 W	00	28	37			1011.0	9.0	8.0	8	24.5	28	8	24.5
SEALAND INNOVATOR	WGKF	22	47.9 N	177.7 E	00	35	M 42	2 NM	53	0996.0	5.0	4.0	6	10	06	6	8
PACIFIC ARROW	J6FM	22	40.1 N	152.0 W	18	24	M 28	10 NM	02	1027.2	12.0		5	6.5	29	8	19.5
MAIN EXPRESS	3EED	23	42.8 N	149.6 E	00	01	M 42	5 NM	42	1009.0	6.0	5.5	9	16.5	03	11	21
ANNA MAERSK	OYKS	23	50.8 N	167.9 W	00	14	10	2 NM	80	0994.7	9.0	7.0	6	5	20	10	23
PACIFIC ARROW	J6FM	24	48.0 N	163.3 W	00	28	M 23		02	1022.0	14.0	13.4	5	8	32	10	19.5
PRESIDENT TYLER	WE2M	25	46.1 N	159.0 E	12	09	M 10	10 NM	02	1020.8	4.4	3.3	1	1.5	04	10	19.5
MING GLORY	BLHX	26	42.0 N	149.3 W	18	17	M 41	2 NM		1012.5	12.0	13.0	6	10	20	8	10

+ Direction of sea waves same as wind
X Direction or period of waves indeterminate
M Measured wind

NOTE: The observations are selected from those with winds ≥ 40 kn or waves ≥ 30 ft from April through September and 45 kn or 38 ft October through March.

U.S. Cooperative Ship Weather Reports

April, May and June 1983

TOTAL WEATHER REPORTS RECEIVED FROM US COOPERATIVE OBSERVING SHIPS APRIL-JUNE 1983

SHIP NAME	VIA RADIO	VIA MAIL
ABUL KALAM AZAD	4	
ALASKA STANDARD	28	46
ALERT	53	
AMCO TRADER	18	27
AMERICAN ACCORD	42	146
AMERICAN AQUARIUS	72	195
AMERICAN HIGHWAY	45	
AMERICAN LEGACY	68	149
AMERICAN LYNX	62	204
AMERICAN TRADER	57	228
ANJA LEONHARDT	61	
ARCO ANCHORAGE	28	31
ARCO PRUDHOE BAY	29	57
ARECIBO	38	118
ASIA HERON	37	102
ATIGUN PASS	61	231
AUSTRAL ENVOY	2	18
B T SAN DIEGO	50	274
BARBER MENESTHEUS		8
BARBER TENNESSEE	10	26
BARRER TSU	21	
BATAND	73	217
BLUE OCEAN	17	215
BORINQUEN	13	62
BRINTON LYKES	14	
C K APOLLO	1	
CARNIVALE	8	
CHAPLOTTE MAERSK	64	91
CHEVRON BURNABY	9	55
CHEVRON LOUISIANA	3	8
CHRISTIAN MAERSK	19	112
CLARA MAERSK	35	123
COLUMBUS AMERICA	40	
CORNUCOPIA	27	196
CRYSTAL STAR	31	137
DACEBANK	41	
DAVID STARR JORDAN	7	36
DEL VIENTO	7	
DELTA CARIBE	33	104
DIANA	25	54
DOLLY TURMAN	13	66
DURABLE	9	
EASTERN PACIFIC	7	34
EDWARD RUTLEDGE	42	190
ELTON HOYT II		71
ESSO BAYONNE		5
EVER VALUE	2	
EXPORT PATRIOT	27	113
EXXON HUNTINGTON	13	59
EXXON NEWARK	16	87
EXXON WASHINGTON	5	5
FIREBUSH WLB 393	4	
FRIENDSHIP	64	
GALVESTON	56	96
GEORGE A STINSON		83
GLACIER WAGB 4	20	24
GOLDEN ALASKA		18
GREAT CONCERT	1	
GREEN FOREST	33	24
GUADALUPE I	9	93
HARBOUR BRIDGE	55	
HESS VOYAGER	56	113
HOEGH CLIPPER	16	68
HOMSING ARROW	1	
HOWELL LYKES	8	
INGER	72	238
ITALICA	24	66
JACKSONVILLE	23	64
JAPAN ACE	208	54
JELA TOPIC	21	
JUSTINE FOSS		23
KAUAI	61	133
KEYSTONE CANYON	17	91
KOREAN FIR	5	
LAKE TAHOE	30	44
LAUREL WLB2901	11	
LETITIA LYKES	15	84
LNG LOUISIANA	6	26
LUCIA DEL MAR	2	
M/V MYRON C. TAYLOR	2	58
MALLOW WLB 396	32	
MARCONA CONVEYOR		38
MARITIME INVESTOR	1	
MAUI	73	170
MELVILLE	83	216
METEOR T-AKR 9	45	
MING MOON	1	39
MOBIL AERO	19	42
MOKU PAHU		31
MORMACLYNX	27	107
MORMACSUN	25	89
NAGARA	17	24
NEPTUNE PEARL	23	72
NORDHVAL	1	
NORTHWIND WAGB 282	42	40
OCEANIC	112	245
OLEANDER	29	17
OREMAR	5	
ORIENTAL SOVEREIGN	20	89
OVERSEAS JUNEAU	56	22
PACBARON	7	6
PACEMPEROR	24	
PACIFIC SUNSHINE		8
PACMERCHANT	24	
PAN DYNASTY		1
PEIRCE	53	
POLAR ALASKA		164
PORTLAND	57	111
PRESIDENT FILLMORE	52	184
ACACIA WLB406	3	
ALASKAN	33	72
ALEUTIAN DEVELOPER	6	140
AMCO VOYAGER	57	118
AMERICAN ACE	65	133
AMERICAN ARCHER	85	186
AMERICAN LANCER	31	130
AMERICAN LEGEND	30	192
AMERICAN MARKETER	38	178
AMERICANA	40	
ANNA MAERSK	29	86
ARCO CALIFORNIA	13	19
ARCO SAG RIVER	49	137
ARGONAUT	17	100
ASIA HONESTY	92	69
ATLANTIC PIONEER	54	
AXEL JOHNSON	14	54
BALD BUTTE	6	104
BARBER PRIAM		58
BARBER TERRIER	19	27
BARRANCA	58	177
BENSON FORD	3	184
BOGASARI DUA	53	
BOSTON	9	16
BROOKS RANGE	14	49
CALCITE II	1	7
CHAPMAN	57	90
CHASTINE MAERSK	37	
CHEVRON CALIFORNIA	81	200
CHEVRON MISSISSIPPI	56	89
CHRISTOPHER LYKES	13	
CLIFFORD MAERSK	82	229
COLUMBUS LOUISIANA	87	
COURAGEOUS WMEC 622	13	
CYGNUS	102	247
DALLAS WHEC 716	41	47
DE STEIGUER T-AGOR12	57	70
DELAWARE II	41	178
DELTA MAR	26	16
DILIGENCE WMEC 616	9	
DON JUAN	21	24
EAGLE	8	
EASTERN VENTURE	43	
EDWIN H GOTT		183
EMPIRE STATE	15	
ESSO EVERETT	6	
EXPORT CHALLENGER	5	13
EXXON BALTIMORE	25	29
EXXON JAMESTOWN	13	31
EXXON NORTH SLOPE	11	25
FAIRWEATHER	8	8
FORTALEZA	98	241
GALLEON HONOR	7	16
GENEVIEVE LYKES	5	54
GEORGE M HUMPHREY	1	120
GLACIER BAY	22	67
GOLDEN DAISY		30
GREAT LAND	21	42
GREEN FOWARD		10
H J HAYNES		211
HARDANGER	12	
HIKAWA MARU	56	14
HOESH MARLIN	12	
HOMSING BREEZE	40	135
HUDSON T-AO 184	34	150
IRIS ISLAND		63
J LOUIS	26	100
JADTEN	11	
JAPAN AMBROSE	116	93
JOHN A. MCCONE		132
KANE T-AGS 27	49	83
KEIYO	8	57
KEYSTONER	56	215
KOREAN JUPITER	13	
LASH ATLANTICO	20	76
LEDA MAERSK	13	47
LEXA MAERSK	1	32
LONG BEACH	9	
LURLINE	82	206
MAIN EXPRESS	82	134
MANISTEE	56	
MARIA TOPIC	32	153
MARJORIE LYKES	13	49
MAUMEE	8	
MELVIN H. BAKER	117	
MIDGETT WHEC 726	56	57
MING STAR	37	62
MOBIL ARCTIC	41	143
MORMACALTAIR	46	161
MORMACRIGEL	4	25
MORMACVEGA	37	119
NANCY LYKES	7	1
NEW INDEPENDENCE	15	23
NORSE PRINCE	68	
NORWAY	5	
OCTA	35	175
OLGA TOPIC	28	38
ORIENTAL EXECUTIVE	47	175
ORIENTAL TAIO	41	
OVERSEAS MARILYN	5	
PACBARONESS	19	21
PACGLORY	27	27
PACIFIC VENTURE	82	199
PACMONARCH	27	
PAN PACIFIC	2	
PETERSBURG	7	72
POLAR SEA	25	305
PRESIDENT ADAMS	40	92
PRESIDENT GRANT	65	119
ACADIA	17	72
ALBATROSS IV	95	99
ALLISON LYKES	20	
AMELIA TOPIC	23	37
AMERICAN ALLIANCE	36	106
AMERICAN ASTRONAUT	30	166
AMERICAN LARK	35	85
AMERICAN LEGION	48	184
AMERICAN MERCHANT	87	143
AMOCO SINGAPORE	8	
AQUARIUS	31	
ARCO FAIRBANKS	15	29
ARCO TEXAS	34	89
ASHLEY LYKES	8	
ASIA INDUSTRY	14	
ATLANTIC RAINBOW	12	
AXEL MAERSK	26	68
BALTIMORE	26	46
BARBER TAIF	31	50
BARBER TOBA	35	62
BASSWOOD WLB388	7	
BERNINA		41
BOGASARI TIGA	5	
BOUTWELL WHEC 719	1	85
BUILDER	6	75
CALIFORNIA RAINBOW	60	170
CHARLES LYKES	47	147
CHERRY VALLEY	16	44
CHEVRON COLORADO	17	92
CHEVRON WASHINGTON	21	71
CHUEN ON	41	187
CLOVER CGC	20	
COPIAPO		11
COVADONGA	38	123
D ALBERTIS	7	28
DANA AMERICA	4	
DEFIANCE		126
DELAWARE TRADER	5	4
DELTA NORTE		1
DISCOVERER OSS	183	232
DRAGOR MAERSK	16	61
EASTERN DIAMOND	7	1
EASTERN WORLD	2	15
EILEEN INGRAM	12	40
ENDEAVOR	2	
ESSO PALM BEACH	2	153
EXPORT CHAMPION	5	115
EXXON CHESTER		6
EXXON LEXINGTON	3	20
EXXON PHILADELPHIA	43	83
FALSTRIA	38	161
FRANCIS SINCERE NO 6	24	41
GALLEON TOURMALINE	28	51
GENISTA	13	
GEORGE M KELLER	76	
GLOBAL FRONTIER	35	166
GOLDEN RAY	3	
GREAT OCEAN	29	
GREEN SAIKAI	14	
HAMILTON WHEC 715	30	39
HEKTOR	23	
HILLYER BROWN	3	
HOEGH MERCHANT	13	
HOTAKA MARU	47	4
HUTLAND VENTURE	63	
IRWIN L. CLYNER		34
J T HIGGINS		118
JALAVIHAR	25	119
JAPAN APOLLO	65	82
JOHN G MUNSON		114
KARINITA		151
KENAI	1	131
KOFUKU MARU	44	143
KOREAN PRIDE	15	6
LASH ITALIA	3	19
LEISE MAERSK	22	68
LICA MAERSK	16	34
LONG LINES	8	32
LYNCH T-AGOR 7		700
MALAYAN KING		45
MANUKAI	49	220
MARINE CHEMICAL TRANSP	8	43
MASON LYKES	20	104
MAYA PIONEER		154
MEONIA	51	141
MILLER FREEMAN	193	166
MING SUN		10
MOBIL LUBE	15	66
MORMACARGO	16	95
MORMACSKY	20	
MT MITCHELL	52	168
NAVASOTA	1	
NEW JERSEY SUN	11	5
NORSE PILOT	31	
NURA DEL MAR	1	
OGDEN DYNACHEM	1	
ORCO MINER	22	
ORIENTAL KNIGHT	11	48
OVERSEAS ARCTIC	80	148
OVERSEAS NEW YORK	47	127
PACDUCHESS	14	
PACIFIC ARROW	98	115
PACLADY	16	20
PACNOBLE	12	8
PANAMA	39	105
PHILADELPHIA	51	134
POLAR STAR WAGB-10	33	128
PRESIDENT CLEVELAND	8	37
PRESIDENT HOOVER	86	214
ADRIAN MAERSK	40	126
ALBERT MAERSK	19	24
ALMERIA LYKES	48	123
AMERICA SUN	27	109
AMERICAN APOLLO	53	112
AMERICAN EXPLORER	32	66
AMERICAN LEADER	44	111
AMERICAN LIBERTY	37	152
AMERICAN RESOLUTE	62	173
AMOCO YORKTOWN	13	
ARCO ALASKA	35	62
ARCO JUNEAU	5	10
ARCTIC TOKYO		39
ASIA BRAVERY	2	106
ASIAN EXPRESS	24	
AUSTIN	1	
B T ALASKA	61	256
BALTIMORE TRADER	3	29
BARBER TALISMAN	10	
BARBER TONSBERG	4	
BAY BRIDGE	23	57
BIBB WHEC 31	38	
BOHEME	58	119
BRIGHT SUN	36	195
BUNGA MELAWIS	131	
CANAL ACE	10	122
CHARLESTON	17	36
CHEVRON ARIZONA	16	42
CHEVRON LONDON		137
CHILULA WMEC-153		73
CITRUS WLB300	6	
CLOVER TRUST	14	
CORINTO MARU	32	17
CRYSTAL REED	13	
D L BOWER		53
DAVID D. IRWIN		7
DEL VALLE	3	
DELTA BRASIL	27	
DELTA SUD	40	106
DOCTOR LYKES	38	143
DUANE	45	80
EASTERN FRIENDSHIP	46	120
EATON GLORIA	22	
ELIZABETH LYKES	53	136
ERNEST R BREECH		63
EVER SPRING	22	25
EXPORT FREEDOM	35	206
EXXON HOUSTON	20	37
EXXON NEW ORLEANS	47	59
EXXON SAN FRANCISCO	48	100
FESTIVALE	20	6
FREDERICK LYKES	21	40
GALLEON TRUST	28	38
GEORGE A SLOAN	2	98
GERONIMO		102
GLOMAR CHALLENGER	131	245
GOWA	17	45
GREEN AUKLET	45	
GREEN STAR	12	
HANJIN POHANG	15	
HERBERT C. JACKSON		118
HOEGH CAIRN	35	94
HOEGH MIRANDA	15	83
HOWARD W BELL		99
INACHUS STAR	81	
IRVING MIAMI	24	
J. L. MAUTHE		166
JAMES LYKES	4	73
JEAN LYKES	26	51
JOHN LYKES	19	18
KARMILA	1	
KENNETH E HILL	25	60
KOREAN COMMANDER	64	99
L.W. FUNMHOUSER	21	110
LASH PACIFICO	16	57
LESLIE LYKES	31	78
LILLOOET	81	103
LUCENT STAR	4	
M P GRACE	25	
MALLORY LYKES	70	183
MANULANI	53	153
MARITIME ACE	15	
MATSONIA	1	
MAYON	2	14
MESABI MINER		74
MING GLORY	26	42
MISSION SANTA CLARA	19	63
MOBILFUEL	5	52
MORMACDRACO	28	78
MORMACSTAR	8	40
MUNRO WHEC 724	2	34
NEPTUNE CRYSTAL	66	
NEWARK	28	143
NORTHERN LIGHT	21	
OAKLAND	29	169
OGDEN THAMES	16	119
ORCO TRADER	56	133
ORIENTAL MINISTER	24	65
OVERSEAS CHICAGO	18	86
OVERSEAS OHIO	18	37
PACDUKE	16	
PACIFIC SABA	41	
PACMAJESTY	13	20
PACSTAR	23	
PARALLA	28	45
PHILIP R CLARKE		104
POLYNESIA	119	249
PRESIDENT EISENHOWER	9	
PRESIDENT JACKSON	34	40

TOTAL WEATHER REPORTS RECEIVED FROM US COOPERATIVE OBSERVING SHIPS APRIL-JUNE 1983

SHIP NAME	VIA RADIO	VIA MAIL	SHIP NAME	VIA RADIO	VIA MAIL	SHIP NAME	VIA RADIO	VIA MAIL	SHIP NAME	VIA RADIO	VIA MAIL
PRESIDENT JEFFERSON	76	202	PRESIDENT JOHNSON	99	171	PRESIDENT KENNEDY	21		PRESIDENT LINCOLN	19	28
PRESIDENT MADISON	77	161	PRESIDENT MC KINLEY	79	201	PRESIDENT MONROE	28	57	PRESIDENT PIERCE	57	107
PRESIDENT ROOSEVELT	15	53	PRESIDENT TAFT	12	48	PRESIDENT TAYLOR	21	39	PRESIDENT TYLER	44	77
PRESIDENT VAN BUREN		122	PRESIDENT WASHINGTON	10		PRESIDENT WILSON	38	78	PRINCE OF TOKYO	61	155
PRINCE WILLIAM SOUND	58	208	PROVINCIA DE EL ORO	1		PUNTA BRAVA	10	43	PUNTA MALVINAS	42	24
QUATSINO SOUND		168	QUINTINA	47		RADIANT VENTURE		4	RAINIER	18	
RALPH B JOHNSON	38		RED ARROW	6		RESEARCHER	91	265	ROACHBANK	5	
ROBERT D CONRAD		202	ROBERT E LEE	18		ROSE	7	111	ROSINA TOPIC		201
ROYAL VIKING SKY	18		ROYAL VIKING STAR	5		RUSH WMEC 723	2		RUTH LYKES	7	
S.S. LNG TAURUS	27	156	S.S. MOBIL MERIDIAN	59	122	S.S. PONCE	3	17	S/S EXXON BOSTON	93	181
S/S LAKE CHARLES		16	SACRAMENTO	35	62	SAINT LOUIS	39	131	SALVADOR	7	38
SAM HOUSTON	19	72	SAMOA	67	54	SAMUEL S	39	48	SAN JUAN	43	201
SAN MARCOS	46	97	SAN PEDRO	15		SANKOGRAIN	13		SANSINENA II	41	41
SANTA ADELA	15	32	SANTA CRUZ	27	32	SANTA FE	55	75	SANTA JUANA	6	42
SANTA LUCIA	7	16	SANTA MAGDALENA		5	SANTA MARTA	25	133	SANTA MERCEDES	94	132
SAPPHIRE	5	29	SARSODHA	36	83	SAUDI MAKKAH	31		SAUDI RIYADH	41	64
SCILLA	32		SEA FAN		19	SEALAND ADVENTURER	54	143	SEALAND CONSUMER	39	120
SEALAND DEFENDER	46	169	SEALAND DEVELOPER	71	188	SEALAND ECONOMY	34	165	SEALAND ENDURANCE	58	194
SEALAND EXPRESS	59	114	SEALAND FREEDOM	44	111	SEALAND INDEPENDENCE	67	149	SEALAND INNOVATOR	47	160
SEALAND LEADER	5	72	SEALAND LIBERATOR	35	160	SEALAND PACER	25	129	SEALAND PATRIOT	64	180
SEALAND PIONEER	9	53	SEALAND PRODUCER	35	167	SEALAND VENTURE	18	131	SEALAND VOYAGER	65	195
SEALIFT ANTARTIC	54	40	SEALIFT MEDITTERRANEAN	6		SEAPAC LEXINGTON	25	45	SEATTLE	33	95
SEDRE WLB 402	7		SENATOR	3	32	SEPTA	47	162	SHINMOO MARU	18	27
SIENA	83	225	SIMRA	42		SINALOA	82	184	SINCERE NO 5	8	
SKAUGRAN	27	141	SKOUBORO	74	183	SOHIO INTREPID	29	131	SOLON TURMAN	25	
SOUTH LIGHT	10		SOUTHERN CROSS	24	37	SOUTHWEST CAPE	45		SS MOBIL GAS	19	67
SS OGDEN WABASH	1		STAR CARRIER	3	22	STAR DIEPPE	59		STAR ENTERPRISE	9	33
STAR MALAYSIA	6	45	STAR THAILAND	1	3	STATE OF MAINE	43		STELLA LYKES	16	22
STOLT LION	3		STOLT LLANDAFF	16	178	STONEWALL JACKSON	10	52	STORIS WMEC 38	4	85
STREAM DOLPHIN	20	16	STREAM HAWSER	16		SUGAR ISLANDER	27	96	SUNBELT DIXIE	48	
SUNDEW WLB 404	1	13	SURVEYOR	157	228	SUSQUEHANNA	32		SWEETBRIER WLB 405	28	
T F L INDEPENDENCE	35	126	T F L LIBERTY	4	39	TAI CORN	14		TAINO VENTURE	1	53
TAMAROA WMEC-166	14	28	TAURUS	13	41	TENCHOBANK	26		TEXACO FLORIDA	1	
TEXACO GEORGIA	2		TEXACO GHENT	38		TEXAS CLIPPER	12		TEXAS TRADER	44	171
TFL DEMOCRACY	15	74	TFL ENTERPRISE	35	176	TFL EXPRESS	41	112	TFL FRANKLIN	3	
TFL FREEDOM	37	81	TFL ITALY	34		TFL JEFFERSON	11		THOMAS G THOMPSON	46	65
THOMAS WASHINGTON	37	113	THOMPSON LYKES	29	63	THOMPSON PASS	15		TILLIE LYKES	21	96
TOGO BRFWER		42	TONCI TOPIC	45	193	TOWSONIA	2		TOWER BRIDGE	57	
TOWNSEND CROMWELL	105	195	TRANSCOLUMBIA	23	92	TRIUMPH	39		TYSON LYKES	66	171
USCGC ESCAPE		1	USCGC IRONWOOD WLB 297	23		USCGC LIPAN	21	137	USCGC RESOLUTE WMEC 62	20	
USCGC VIGOROUS	3		USNS NORTH STAR III	3	2	USNS APACHE	17	39	USNS BARTLETT	41	194
USNS COMET TAKR 7	38	75	USNS MOHAWK	28	58	USNS NEOSHO AT-AO-143)		75	USNS PAWCATUCK TAO-108		49
USNS RIGEL TAFS8		112	USNS SEALIFT PACIFIC	19	57	USNS TRUCKEE TAO-147		59	VALIANT	2	1
VALLEY FORGE	18	63	VAN CONQUEROR	75	182	VAN HAWK	46		VAN TRIUMPH	38	
VELMA LYKES	26	104	VENTUROUS WPC 625	9		VIOLET	63	67	WALCHAND	68	
WALTER RICE	3	131	WASHINGTON TRADER	6	14	WECOMA	2	39	WENDY FOSS		62
WESER EXPRESS	94	78	WESTERN SUN	1	123	WESTWARD		19	WESTWARD VENTURE	58	121
WESTWIND WAGB 281	19	26	WILLIAM A. POESCH		38	WILLIAM E MUSSMAN	26	63	WILLIAM HOOPER		29
WORLD CANDOUR	13	28	WORTH	29	80	YOCONA WMEC 168	36		ZEPHUNTER	33	68
ZIM HONGKONG	22		ZOELLA LYKES	26		3FAB	32	59	5MPG	6	
9VYA	1		ABSP	29	48	A8UA	37	19	C2DG	33	16
C5BU	5	47	D5NP	1		D5S6	1		ELYM	15	92
GRAF	36	62	GYEV	24		H3PN	10		JJBL	1	
JPWJ		54	KAA7	19		KCBN	1		KEAN	9	70
KFRJ	18		KGPA	15		KGYE	25	103	KLMV	3	
OXTH	3		WLDP	33	43	XCPH	4		ZCKP	88	159

SUMMARY: GRAND TOTAL VIA RADIO 18254 GRAND TOTAL VIA MAIL 43473

THE MARINERS WEATHER LOG WELCOMES ARTICLES AND LETTERS FROM MARINERS RELATING TO METEOROLOGY AND OCEANOGRAPHY, INCLUDING THEIR EFFECTS ON SHIP OPERATIONS.

WE OF NOAA ARE MAKING USE OF THIS SMALL AMOUNT OF SPACE TO EXTEND OUR THANKS TO ALL THE SHIPS' OFFICERS WHO ROUTINELY TAKE SHIPBOARD WEATHER OBSERVATIONS. TO US, THESE EXCELLENT OBSERVATIONS ARE PRICELESS. WE CERTAINLY APPRECIATE RECEIVING THEM REGULARLY.

U.S. NDBC Climatological Data

April, May and June 1983

APRIL 1983

BUOY	LAT	LONG	AIR TEMPERATURE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	SEA TEMPERATURE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	AIR-SEA TEMPERATURE DIFFERENCE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	34.9N	072.9W	707	30	20.5	28 15	06.9	20 01	16.5	709	30	20.8	22 20	18.2	18 12	19.4	712	30	01.0	28 15	-11.6	20 01	-02.9
41002	32.3N	075.3W	712	30	23.3	28 22	11.7	20 13	18.4	712	30	23.3	25 07	18.9	02 05	20.1	712	30	01.4	03 10	-07.6	20 13	-01.7
41006	29.3N	077.3W	712	30	24.7	24 12	15.8	20 09	21.0	711	30	25.0	22 19	20.8	04 03	23.3	712	30	01.3	03 11	-07.1	20 09	-02.3
42001	25.9N	089.7W	711	30	25.6	14 02	19.5	17 00	23.3	711	30	25.6	11 20	22.0	01 05	23.2	711	30	02.4	11 14	-04.0	03 21	00.1
42002	26.0N	093.5W	712	30	23.9	30 19	17.4	10 08	21.5	712	30	23.9	28 20	21.4	10 07	22.2	712	30	01.7	05 16	-04.2	09 21	-00.7
42003	26.0N	085.9W	238	30	26.6	09 12	18.1	17 03	22.6	238	30	26.7	09 00	22.6	04 12	25.8	238	30	00.5	23 15	-07.7	17 03	-03.2
42007	30.1N	088.9W	509	23	21.9	23 21	09.1	19 10	17.8	509	23	21.9	30 22	14.8	01 00	18.4	712	30	03.4	23 21	-08.2	19 10	-00.4
42008	28.7N	095.3W	712	30	22.8	23 22	09.9	08 08	17.6	712	30	20.0	29 20	15.6	01 11	17.4	712	30	05.5	01 22	-06.1	06 16	00.2
42009	29.3N	087.5W	710	30	22.2	23 09	11.7	19 11	18.1	710	30	21.9	21 21	17.8	04 09	19.2	711	30	03.1	07 20	-07.6	19 17	-01.0
44003	40.8N	068.5W	712	30	13.2	25 03	02.6	02 03	07.2	712	30	06.9	28 20	04.6	03 03	05.5	712	30	07.0	25 03	-02.2	02 02	01.7
44004	38.5N	070.7W	249	12	18.4	24 20	06.9	20 17	14.0	249	12	18.7	23 19	15.7	22 07	16.8	711	30	00.6	24 20	-09.4	20 17	-06.2
44005	42.7N	068.3W	692	30	10.0	30 22	00.4	01 20	05.8	692	30	07.0	30 20	04.3	12 11	05.3	692	30	04.0	17 10	-04.2	01 20	00.5
44007	43.5N	070.1W	711	30	13.9	30 03	01.7	01 12	05.7														
44008	40.5N	069.4W	651	28	12.7	24 22	01.6	01 15	07.0	652	28	07.7	07 20	04.4	03 15	05.7	709	30	06.8	24 22	-03.7	01 18	01.5
45001	48.0N	087.6W	220	10	06.9	27 04	00.0	24 18	02.9	222	10	02.3	30 19	01.7	25 04	02.0	222	10	04.9	27 04	-02.1	24 18	00.9
45002	45.3N	086.3W	610	27	09.5	27 04	00.0	15 07	03.4	712	30	03.5	27 20	02.9	04 00	03.1	712	30	06.2	27 04	-03.1	15 07	-00.1
45003	45.3N	082.8W	632	29	08.0	27 17	00.0	20 17	03.1	711	30	03.2	12 19	02.7	01 00	02.9	711	30	04.8	27 17	-02.9	20 16	-00.1
45004	47.2N	086.5W	199	09	08.0	27 00	00.7	24 19	03.4	199	09	02.3	29 20	01.8	23 00	02.0	199	09	06.0	27 00	-01.2	24 19	01.4
45005	41.7N	082.5W	403	19	14.2	27 21	00.0	18 07	06.2	435	19	07.6	26 20	04.1	13 05	05.3	435	19	08.7	14 18	-05.3	17 22	00.4
45006	47.3N	090.0W	223	10	09.0	25 22	00.3	24 11	03.1	223	10	02.0	28 17	01.0	24 13	01.7	223	10	07.1	25 22	-01.0	24 10	01.4
45007	42.7N	087.1W	657	29	10.0	26 23	00.0	17 06	04.2	712	30	04.7	29 19	02.9	01 00	03.6	712	30	06.0	26 23	-03.6	19 08	00.3
45008	44.3N	082.4W	652	29	09.4	27 21	00.0	19 01	03.1	712	30	03.1	27 21	01.7	01 02	02.2	712	30	06.4	27 18	-02.3	16 13	00.6
46001	56.3N	148.3W	710	30	07.5	23 02	01.7	08 21	04.9	712	30	07.9	23 03	05.2	01 19	06.3	712	30	00.6	02 08	-04.3	08 21	-01.4
46002	42.5N	130.3W	712	30	12.3	30 02	05.3	09 21	09.5	712	30	12.2	18 23	10.1	01 03	10.7	712	30	01.2	16 09	-05.0	09 21	-01.2
46003	51.9N	155.7W								712	30	06.2	26 01	04.4	07 13	04.9							
46004	50.9N	135.9W	710	30	09.4	28 01	03.4	08 06	06.7	712	30	09.1	16 00	06.7	01 07	07.1	712	30	02.0	23 05	-03.7	08 06	-00.4
46005	46.1N	131.0W	708	30	09.8	27 08	04.4	09 11	07.8	708	30	09.9	23 23	08.6	11 13	09.2	708	30	00.5	27 08	-04.4	09 13	-01.4
46006	40.7N	137.7W	691	30	12.6	06 00	06.9	26 14	10.1	696	30	11.2	08 01	10.0	22 13	10.4	711	30	02.0	16 20	-03.5	10 03	-00.3
46010	46.2N	124.2W	678	30	17.6	17 21	04.6	11 16	10.2	670	30	13.3	28 21	09.5	07 13	11.4	712	30	05.7	17 21	-05.2	11 16	-01.2
46011	34.9N	120.9W	647	28	15.3	19 20	08.6	12 05	12.6	647	28	14.8	15 20	12.3	05 14	13.6	709	30	02.2	18 02	-05.2	12 05	-00.9
46012	37.4N	122.7W	169	08	14.1	28 22	10.7	25 05	12.4	169	08	13.8	29 00	12.6	24 17	13.1	711	30	00.6	28 17	-02.0	25 05	-00.9
46013	38.2N	123.3W	684	30	14.9	19 22	09.3	10 12	11.8	684	30	13.5	02 01	10.2	14 08	12.0	709	30	03.0	19 22	-02.4	03 14	-00.2
46014	39.2N	124.0W	710	30	15.6	19 21	08.3	13 14	11.7	710	30	14.8	15 23	11.5	12 16	12.6	710	30	02.4	06 07	-04.2	23 15	-00.9
46016	63.3N	170.3W	012	04	00.4	28 00	00.1	23 03	00.1														
46017	60.3N	172.3W	056	12	01.9	25 21	00.1	10 03	00.8														
46019	57.2N	170.3W	124	22	04.3	26 21	00.1	08 18	02.0														
46020	55.9N	168.0W	188	28	05.0	28 00	00.3	01 06	02.7	234	30	04.3	27 00	02.3	06 00	03.0	235	30	01.9	14 09	-02.4	01 06	-00.7
46022	40.8N	124.5W	711	30	14.7	16 23	05.6	10 19	10.7	712	30	13.5	17 00	10.4	13 11	11.6	712	30	02.6	17 15	-05.8	10 19	-00.9
46023	34.3N	120.7W	163	08	15.6	29 19	12.5	24 06	13.8	163	08	15.4	29 19	13.2	01 00	14.2	641	28	01.3	01 01	-01.8	29 23	00.9
46024	32.8N	119.2W	709	30	16.9	23 22	11.2	12 14	13.9	709	30	17.4	24 01	13.7	13 15	14.8	710	30	01.1	18 17	-03.4	12 14	-00.9
46025	33.6N	119.0W	710	30	17.6	01 22	10.7	12 11	14.2	707	30	17.6	27 21	13.3	13 07	15.0	710	30	01.8	06 20	-03.0	27 20	-00.9
46026	37.8N	122.7W	709	30	16.6	06 01	08.7	12 15	12.0	706	30	15.1	01 21	11.1	13 13	12.7	709	30	03.7	06 01	-03.3	03 18	-00.7
CSBF1	29.7N	085.4W	552	26	22.6	30 16	10.6	20 11	17.6														
DBLN6	42.6N	079.5W	661	30	18.4	30 18	00.0	20 11	06.2														

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BUOY	LAT	LONG	PRESSURE (MB) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	WIND SPEEDS (KNOTS) OBS	MAX	DY HR	DIR	MEAN WIND SPEED (KNOTS) N	NE	E	SE	S	SW	W	NW	TOTAL
41001	34.9N	072.9W	710	30	1028.0	30 13	993.3	24 21	1014.7	709	44	19 06	210	13.6	11.6	9.5	15.8	20.6	14.9	18.8	16.5	17.0
41002	32.3N	075.3W	712	30	1026.3	29 16	995.9	24 20	1015.7	703	29	19 04	240	8.9	10.2	8.3	10.1	13.4	12.1	13.2	13.9	12.3
41006	29.3N	077.3W	712	30	1022.9	29 17	999.2	24 10	1015.2	707	27	16 06	190	5.5	6.3	8.5	10.9	14.6	13.7	12.8	10.2	11.2
42001	25.9N	089.7W	711	30	1022.6	17 15	1006.0	22 23	1013.2	703	29	13 10	140	18.9	12.8	10.1	17.5	17.8	11.5	12.8	16.3	16.1
42002	26.0N	093.5W	712	30	1024.9	17 04	1003.1	05 01	1012.8	697	33	14 19	040	16.4	18.8	13.3	16.2	11.9	8.9	6.5	14.6	14.9
42003	26.0N	085.9W	238	30	1020.8	11 15	1005.0	23 21	1013.9	238	26	09 09	160	13.2	8.7	13.1	16.1	21.1	13.4	15.5	13.3	14.3
42007	30.1N	088.9W	712	30	1023.0	16 16	999.9	23 21	1013.1	707	31	02 08	280	15.3	11.9	12.3	13.2	13.3	12.4	15.3	15.6	13.8
42008	28.7N	095.3W	711	30	1025.4	16 16	1000.2	01 21	1011.8	711	41	02 00	310	17.3	13.7	11.8	12.2	13.1	11.8	13.3	16.4	13.6
42009	29.3N	087.5W	710	30	1021.6	10 16	1000.5	23 09	1013.6	702	29	02 09	270	14.9	9.3	9.7	12.5	13.2	11.1	15.8	13.3	13.1
42011	29.6N	093.5W	214	11	1016.1	29 17	997.3	01 22	1009.9	213	33	02 01	290	9.6	12.2	14.8	14.0	12.2	17.2	20.6	20.7	14.8
44003	40.8N	068.5W	712	30	1032.1	14 17	991.7	25 12	1012.2	712	38	01 20	030	15.7	15.3	14.3	13.3	8.5	11.1	9.9	15.9	12.1
44004	38.5N	070.7W	576	28	1026.9	30 13	990.1	25 01	1011.5	672	38	01 13	010	21.3	16.4	16.1	16.2	14.8	15.0	15.6	12.8	15.4
44005	42.7N	068.3W	692	30	1034.2	14 14	991.8	25 14	1012.3	690	31	02 01	360	13.0	8.7	14.6	13.5	10.1	11.3	8.1	12.1	11.6
44007	43.5N	070.1W	711	30	1035.3	14 15	990.5	25 09	1012.5	703	24	24 21	080	10.3	10.1	12.9	10.1	9.2	10.1	8.8	9.3	10.3
44008	40.5N	069.4W	652	28	1032.0	14 15	990.6	25 10	1011.4	206	38	01 20	010	26.5	18.8	14.3	11.8	12.9	12.4	12.3	13.9	15.3
45001	48.0N	087.6W	222	10	1021.5	23 15	998.5	27 04	1012.6	217	17	27 19	260	6.0	7.0	6.8	7.3	6.8	5.6	8.0	6.7	07.1
45002	45.3N	086.3W	712	30	1025.2	05 18	990.4	14 14	1013.1	704	27	14 23	180	11.3	11.7	10.8	9.1	11.7	7.9	9.2	9.2	10.4
45003	45.3N	082.8W	711	30	1023.8	06 04	997.2	14 22	1012.7	705	29	14 14	150	11.7	8.9	12.7	12.5	11.6	8.6	10.9	11.3	11.3
45004	47.2N	086.5W	199	09	1020.9	23 15	1001.2	27 06	1013.4	194	17	27 20	290	6.0	4.5	3.3	6.8	6.2	4.3	7.5	7.7	06.5
45005	41.7N	082.5W	435	19	1019.8	12 20	1000.4	14 18	1011.9	432	25	17 15	320	12.1	8.8	7.4	8.6	9.0	9.3	10.5	12.1	09.9
45006	47.3N	090.0W	223	10	1022.5	23 16	999.1	27 00	1013.2	216	14	27 16	250	4.0	5.4	4.9	5.4	4.6	6.5	6.3	5.0	05.4
45007	42.7N	087.1W	712	30	1024.1	05 17	993.3	14 11	1012.8	700	27	02 16	080	12.6	8.2	12.6	9.9	8.9	10.2	8.9	8.2	10.3
45008	44.3N	082.4W	712	30	1024.4	05 20	998.4	03 12	1012.8	705	28	14 12	140	10.6	9.3	11.1	10.8	9.1	10.2	7.3	11.7	10.2
46001	56.3N	148.3W	712	30	1025.9	09 05	986.9	21 03	1011.7	688	25	03 19	130	6.3	8.9	7.2	10.6	12.2	12.5	11.8	8.2	11.2
46002	42.5N	130.3W	712	30	1032.9	04 09	1002.4	18 02	1016.3	677	28	01 05	170	12.1	13.2	9.0	17.4	13.2	13.4	13.9	12.9	12.8
46003	51.9N	155.7W	712	30	1035.7	08 14	982.9	03 10	1013.8	711	43	03 12	190	9.8	5.8	34.7	27.1	22.0	20.2	17.8	16.0	18.8
46004	50.9N	135.9W	712	30	1032.3	15 21	981.2	01 22	1016.3	710	41	01 07	110	15.7	10.7	14.9	23.3	21.1	14.9	15.1	14.9	16.1
46005	46.1N	131.0W	708	30	1033.4	04 07	1000.0	22 10	1016.4	705	36	02 03	240	13.9	10.5	11.5	15.0	13.4	13.4	14.2	14.0	13.7
46006	40.7N	137.7W	711	30	1034.4	07 20	1007.9	27 03	1019.9	709	34	01 05	240	18.6	17.6	8.7	7.0	15.1	15.0	20.0	18.5	17.5
46010	46.2N	124.2W	702	30	1030.4	04 18	1003.8	18 01	1016.4	702	24	01 20	170	9.4	6.1	7.9	9.7	12.7	10.9	7.8	9.0	09.5
46011	34.9N	120.9W	647	28	1021.4	22 19	1000.4	18 11	1014.2	624	31	03 01	320	9.7	5.7	9.8	15.7	12.2	9.8	6.3	15.8	13.5
46012	37.4N	122.7W	633	29	1021.2	09 21	1001.8	18 09	1014.4	699	26	03 04	320	9.5	7.9	7.5	13.4	11.5	8.4	6.0	12.9	11.4
46013	38.2N	123.3W	684	30	1024.3	01 02	1003.1	18 11	1014.8	437	23	21 04	300	9.7	10.7	7.8	11.8	11.4	7.6	9.9	12.0	10.4
46014	39.2N	124.0W	710	30	1027.1	01 05	1002.1	18 13	1015.3	691	35	04 00	320	13.3	5.0	7.0	12.6	13.8	11.1	8.6	16.8	13.4
46016	63.3N	170.3W	230	30	1029.0	08 12	976.7	17 18	1005.7	228	49	04 21	040	10.4	19.5	14.2	17.2	15.1	12.1	7.8	9.1	16.5
46017	60.3N	172.3W	236	30	1030.0	08 06	969.4	14 15	1002.[illegible]	235	37	14 06	140	8.0	14.0	12.6	16.6	18.5	13.8	12.4	8.8	14.3
46019	57.2N	170.3W	236	30	1029.8	07 21	976.9	14 09	1003.1	236	28	22 03	150	17.5	18.0	12.4	16.1	15.4	14.2	14.4	13.7	15.5
46020	55.9N	168.0W	193	25	1030.3	07 21	982.2	14 12	1001.9	234	29	04 09	340	16.5	11.7	9.8	17.6	16.6	15.6	17.5	16.3	16.2
46022	40.8N	124.5W	712	30	1027.6	03 17	1003.0	18 14	1015.4	707	31	24 15	120	17.5	6.7	7.5	11.2	15.2	10.1	7.1	10.5	13.0
46023	34.3N	120.7W	641	28	1021.1	22 19	1002.0	20 13	1014.7	625	30	02 21	330	15.0	5.5	6.8	11.4	9.5	7.7	6.7	16.1	13.6
46024	32.8N	119.2W	710	30	1021.6	09 21	1005.5	20 11	1015.4	690	35	03 23	310	10.4	8.0	9.7	12.6	8.4	9.1	8.7	16.1	13.3
46025	33.6N	119.0W	710	30	1020.9	09 21	1005.1	20 12	1014.6	696	27	02 23	290	5.2	9.4	4.5	8.8	7.0	6.9	10.7	12.3	09.9
46026	37.8N	122.7W	709	30	1025.6	01 04	1002.3	18 09	1015.5	701	25	04 02	320	9.5	8.9	7.3	12.1	12.0	8.6	8.0	13.3	11.3
CSBF1	29.7N	085.4W	703	30	1021.5	30 16	1000.9	23 23	1014.9	711	26	23 10	160	4.5	3.2	6.3	6.4	6.4	9.8	13.4	6.5	07.7
DBLN6	42.6N	079.5W	709	30	1023.1	05 15	997.7	03 07	1011.9	710	30	21 17	240	10.2	11.2	8.6	10.9	6.3	13.7	11.8	13.7	11.6

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BUOY	LAT	LONG	WAVE HEIGHTS (METERS) OBS	MAX	DY HR	MEAN	FREQUENCY OF WAVE HEIGHTS (%) <1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	706	8.0	01 08	2.2	6.5	43.4	16.2	15.5	16.4	1.5	0.1	
41002	32.3N	075.3W	700	5.5	24 11	1.8	10.8	45.0	25.1	12.5	6.4			
41006	29.3N	077.3W	709	4.5	25 11	1.7	4.7	51.7	30.8	10.8	1.6			
42001	25.9N	089.7W	710	4.0	15 19	1.5	7.8	62.3	25.3	3.6	0.7			
42002	26.0N	093.5W	712	4.5	14 22	1.6	9.2	56.6	26.1	6.8	1.1			
42007	30.1N	088.9W	625	2.0	02 05	0.8	46.0	51.5	2.4					
42009	29.3N	087.5W	700	4.5	02 17	1.4	20.4	44.7	29.2	4.0	1.5			
44003	40.8N	068.5W	707	8.0	02 05	2.2	4.8	37.7	30.6	13.2	11.1	2.1	0.1	
44004	38.5N	070.7W	666	7.5	01 12	2.4	4.8	42.6	16.9	18.3	12.1	5.1		
44005	42.7N	068.3W	691	7.0	02 08	2.0	5.2	42.9	30.5	12.8	7.0	1.3		
44007	43.5N	070.1W	677	5.0	11 08	1.4	18.9	50.3	22.5	5.0	3.1			
44008	40.5N	069.4W	612	8.0	01 22	2.1	9.1	36.6	27.2	13.0	12.8	1.1	0.1	
45001	48.0N	087.6W	179	2.0	27 19	0.7	65.3	31.8	2.7					
45002	45.3N	086.3W	613	4.5	15 04	0.9	45.1	45.5	7.1	1.4	0.6			
45003	45.3N	082.8W	608	4.0	14 19	0.9	46.6	42.9	8.5	1.6	0.1			
45005	41.7N	082.5W	353	2.5	24 23	0.9	36.2	57.7	5.9					
45006	47.3N	090.0W	106	1.5	27 14	0.5	86.7	13.2						
45008	44.3N	082.4W	630	3.5	14 17	1.0	40.0	47.4	11.4	1.1				
46001	56.3N	148.3W	712	5.5	04 14	2.3	0.9	25.9	46.7	18.2	8.0			
46002	42.5N	130.3W	711	8.5	01 22	2.4	0.2	21.3	55.5	14.9	4.7	2.3	0.7	
46003	51.9N	155.7W	712	9.5	03 19	2.8		19.3	31.7	27.6	18.6	1.9	0.5	
46004	50.9N	135.9W	710	8.5	01 22	2.6		23.0	46.1	17.7	9.2	3.3	0.2	
46005	46.1N	131.0W	707	10.0	01 22	2.4		32.9	44.8	11.8	5.7	2.2	2.1	0.1
46006	40.7N	137.7W	710	9.5	01 10	2.8	0.1	12.9	47.3	23.8	12.1	1.6	1.9	
46010	46.2N	124.2W	700	6.5	02 08	1.9	0.7	57.2	28.1	7.8	4.8	1.1		
46011	34.9N	120.9W	642	5.5	03 01	1.9	7.7	44.0	27.8	12.9	7.3			
46012	37.4N	122.7W	710	5.0	03 04	2.1	3.9	27.8	48.1	15.2	4.7			
46013	38.2N	123.3W	683	5.5	03 01	2.2	0.8	33.6	42.3	15.3	7.7			
46022	40.8N	124.5W	711	5.5	02 16	2.1	2.8	37.1	35.4	15.6	9.0			
46023	34.3N	120.7W	641	6.0	03 05	2.3	0.1	34.0	36.5	20.7	8.2	0.3		
46024	32.8N	119.2W	701	5.5	03 19	1.7	15.2	44.5	21.8	11.6	6.7			
46025	33.6N	119.0W	700	4.0	03 02	1.4	17.7	50.4	25.1	6.1	0.5			
46026	37.8N	122.7W	702	4.0	02 16	1.6	5.1	52.5	35.7	6.2	0.2			

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BUOY	LAT	LONG	TOTAL FREQUENCY OF WIND SPEEDS (%) CALM	<4KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	TOTAL FREQUENCY OF WIND DIRECTIONS (%) N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		1.8	18.6	51.2	25.4	3.0		6.3	1.4	1.8	9.3	18.0	23.3	23.6	16.3
41002	32.3N	075.1W		5.1	34.4	58.5	8.0			5.5	4.2	3.7	12.8	21.7	11.8	21.3	19.7
41006	29.3N	077.3W		6.2	42.0	47.9	3.8			5.4	2.4	10.1	20.8	17.5	6.8	15.3	23.7
42001	25.9N	089.7W		2.8	16.1	51.3	19.8			10.6	5.0	9.8	15.4	7.9	6.8	9.2	12.4
42002	26.0N	093.5W		2.4	19.8	53.3	14.5			13.3	9.0	14.2	11.5	6.4	6.8	8.2	9.8
42003	26.0N	085.9W		2.9	17.5	74.4	5.0			14.5	3.3	30.0	27.7	3.9	6.8	4.6	10.0
42007	30.1N	088.9W		0.7	23.1	69.4	6.8			9.6	4.1	9.2	10.1	12.6	9.5	16.7	8.6
42008	28.7N	095.1W		1.1	27.4	65.8	5.1	0.6		13.9	5.3	14.0	23.3	18.2	7.5	2.7	13.2
42009	29.3N	087.5W		1.3	35.2	58.7	4.8			9.6	4.8	9.3	35.8	8.4	5.8	20.0	6.5
42011	29.6N	093.5W			18.3	70.4	11.3			3.9	2.7	17.8	41.1	16.3	2.0	10.2	6.0
44003	40.8N	068.5W		5.3	37.8	49.7	5.5	1.7		4.6	8.1	13.7	10.8	16.1	23.7	12.6	8.5
44004	38.5N	070.7W		0.4	19.3	66.2	12.6	1.3		4.6	5.0	9.5	8.6	14.0	24.4	24.1	9.8
44005	42.7N	068.7W		4.9	40.3	49.0	5.8			9.2	3.9	15.4	14.5	28.8	11.6	9.2	7.4
44007	43.5N	070.1W		6.8	45.9	45.8	1.4			13.4	9.0	17.8	15.0	10.2	10.7	7.7	5.8
44008	40.5N	069.4W		0.5	19.4	64.6	10.7	4.9		10.8	11.8	19.5	9.6	7.6	5.9	16.4	18.3
45001	48.0N	087.6W		15.2	70.0	14.7				3.2	9.8	3.9	18.3	8.6	14.4	32.7	9.0
45002	45.3N	086.3W		4.4	50.6	43.0	2.0			20.9	10.4	16.9	5.7	10.0	8.9	7.8	13.4
45003	45.3N	082.8W		3.5	47.5	45.4	3.5			9.2	5.1	22.0	7.9	8.1	8.5	16.9	22.3
45004	47.2N	086.5W		19.6	72.2	8.2				10.2	4.6	3.6	16.5	17.0	6.8	18.0	23.2
45005	41.7N	082.5W		6.3	50.5	41.9	1.4			13.3	7.8	13.5	10.6	7.2	10.6	15.6	17.4
45006	47.3N	090.0W		26.4	66.5	5.1				9.1	14.8	9.0	14.0	16.9	10.1	13.4	9.6
45007	42.7N	087.1W		7.7	49.0	39.6	3.7			22.1	11.9	15.7	7.9	10.7	8.0	13.0	10.7
45008	44.3N	082.4W		7.5	47.5	43.1	1.8			11.5	9.0	17.3	15.0	6.2	10.0	11.6	17.6
46001	56.3N	148.3W		6.5	19.4	50.7	3.3			4.8	2.5	2.7	6.6	16.9	30.3	28.1	8.1
46002	42.5N	130.3W		7.4	26.9	60.9	4.9			28.5	15.9	6.2	3.8	7.6	3.5	15.3	19.2
46003	51.9N	155.7W		1.3	12.5	49.8	33.1	3.1		3.1	0.5	0.9	3.1	1.2	10.7	31.8	17.2
46004	50.9N	135.9W		2.4	18.3	60.6	18.3	0.4		20.5	8.7	5.2	8.1	10.9	16.1	19.8	15.8
46005	46.1N	131.0W		4.0	29.2	55.5	10.8	0.6		17.8	4.0	3.3	4.9	11.3	13.6	20.3	24.8
46006	40.7N	137.7W		3.0	19.8	48.5	32.3	0.4		28.9	14.7	3.9	0.7	11.2	9.6	17.5	13.5
46010	46.2N	124.2W		7.4	51.7	40.6	0.3			24.4	8.7	9.6	3.7	13.8	12.6	5.1	22.1
46011	34.9N	120.9W		3.8	30.9	54.3	10.9			11.2	4.4	1.5	16.3	10.7	3.4	4.4	48.0
46012	37.4N	122.7W		4.9	39.1	48.8	5.3			8.8	2.0	2.3	12.8	16.9	5.2	8.4	43.7
46013	38.2N	123.3W		11.9	73.2	13.1	1.8			17.7	8.0	7.7	22.7	14.4	6.8	9.4	11.3
46014	39.2N	124.0W		8.2	28.7	48.6	14.2	0.3		18.8	4.3	6.7	10.7	16.2	4.1	2.9	36.3
46015	43.3N	170.5W		1.8	23.2	56.4	15.8	2.8	0.4	4.2	69.5	15.7	13.4	0.8	10.4	1.5	1.5
46017	60.3N	172.3W		4.7	30.6	46.0	17.4	1.3		6.7	22.8	15.7	15.0	14.7	19.9	4.1	1.1
46019	57.2N	170.3W		1.7	16.5	69.9	11.9			13.5	12.9	1.2	10.6	10.3	26.0	20.4	5.2
46020	55.9N	168.0W			19.1	69.2	10.7			8.0	8.2	1.4	14.9	19.7	16.7	19.2	13.2
46022	40.8N	124.5W		8.1	78.3	13.6	0.0			34.0	8.3	7.2	12.8	14.7	6.4	4.2	12.4
46023	34.3N	120.7W		5.3	26.9	57.4	10.4			13.7	0.1	1.9	14.6	5.2	4.8	7.4	52.3
46024	32.8N	119.2W		4.8	30.6	52.9	11.2	0.6		4.9	1.1	0.8	5.4	9.1	8.8	11.9	58.6
46025	33.6N	119.0W		11.1	50.9	32.3	4.7			4.1	1.8	2.2	10.3	8.4	9.0	37.3	26.8
46026	37.8N	122.7W		8.0	34.5	55.5	2.0			5.6	4.7	5.0	6.4	16.7	7.2	13.0	41.5
C58F1	29.7N	085.9W	6.8	23.2	53.2	21.1	2.5			8.2	6.9	10.7	19.7	6.8	9.2	20.4	18.2
DBLN6	42.6N	079.5W	2.0	10.7	34.1	47.0	6.2			9.3	15.4	8.9	12.0	7.7	12.7	11.1	7.9

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BUOY	LAT	LONG	% FREQUENCY OF WIND SPEEDS (<4 KTS) N	NE	E	SE	S	SW	W	NW	% FREQUENCY OF WIND SPEEDS (4-10 KTS) N	NE	E	SE	S	SW	W	NW	% FREQUENCY OF WIND SPEEDS (11-21 KTS) N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.2	<.05	0.1	0.3	0.1	0.2	0.5	0.3	0.6	0.6	1.2	2.1	1.4	4.3	3.5	2.9	5.1	0.8	0.6	0.9	0.8	12.2	9.8	0.9
41002	32.3N	075.1W	0.7	<.05	<.05	0.1	0.3	1.1	0.3	2.5	1.6	1.4	6.8	6.7	4.3	6.5	4.6	2.2	2.5	1.0	0.6	13.1	5.9	11.8	13.9	1.4
41006	29.3N	077.3W	2.0	0.7	0.4		0.7	0.2	0.7	1.6	2.7	1.6	6.7	10.5	2.1	1.7	6.2	2.1	0.7	0.1	3.0	11.3	13.5	2.3	0.6	11.3
42001	25.9N	089.7W	0.1	0.2	0.5	0.9	0.2	0.2	0.2	1.1	1.8	0.8	3.6	2.1	1.5	3.7	2.8	1.5	3.2	0.5	0.4	2.8	2.7	7.1	7.4	0.9
42002	26.0N	093.5W			0.4	0.3	0.4	1.0	0.3	1.8	1.0	0.6	3.6	4.5	4.5	2.1	1.8	0.5	0.8	0.7	10.6	29.8	3.6	1.5	0.4	3.9
42003	26.0N	085.9W	1.2	0.4		0.4		0.4		0.5	0.9	2.2	5.5	0.5		1.3	0.7	2.5	7.6	0.6	24.6	24.8	1.7	0.3	3.9	0.9
42007	30.1N	088.9W	0.1	0.1	0.1	0.2	0.1				2.1	1.3	2.8	4.7	2.8	1.7	4.2	2.6	4.2	23.5	5.1	2.1	0.6	0.9	1.2	0.3
42008	28.7N	095.1W	0.3		0.4	<.05	0.2	0.2			0.5	0.9	5.2	8.6	5.8	2.3	1.2	1.1	11.1	1.1	0.4	10.4	10.4	6.1	1.4	0.5
42009	29.3N	087.5W	0.2	0.2	0.2	0.2	0.1		0.1	0.2	1.9	2.9	5.1	12.9	3.0	2.6	4.1	2.6	7.0	1.6	3.9	22.0	5.0	0.9	12.9	5.5
42011	29.6N	093.5W									2.0	0.8	0.7	6.6	5.5	0.6	0.8	1.3	1.9	0.5	1.7	13.5	11.0	0.8	2.1	1.1
44003	40.8N	068.5W	0.3	0.3	0.2	1.0	2.4	0.7	0.6		0.5	2.0	1.9	3.5	10.9	9.0	4.8	3.2	3.0	0.4	11.1	1.7	0.7	11.3	7.1	0.2
44004	38.5N	070.7W	0.1						0.1	0.2	0.9	1.0	1.3	0.9	2.6	6.9	3.8	1.8	1.2	3.8	7.3	6.9	9.9	12.0	18.4	7.6
44005	42.7N	068.7W	1.3	0.2	0.2	0.7	1.1	0.8	0.9	0.2	3.6	2.5	1.5	3.5	11.4	6.4	3.6	2.0	1.2	1.2	7.1	0.5	0.8	7.1	12.9	1.9
44007	43.5N	070.1W	0.5	0.9	0.7	1.0	1.2	0.8	1.1	0.6	5.9	3.7	5.0	7.0	11.0	5.6	3.7	4.0	7.0	5.2	11.1	1.6	0.6	5.9	9.3	2.9
44008	40.5N	069.4W				0.5					1.2	0.7	3.6	3.6	1.3	0.5	0.6	3.8	2.4	7.4	14.3	4.6	0.3	5.5	11.8	12.3
45001	48.0N	087.6W		1.8	1.8	1.4	1.2	2.6	5.4	0.9	3.2	7.9	1.5	13.7	4.7	10.4	19.0	7.1			1.0	2.0	0.8	0.9	0.2	
45002	45.3N	086.3W	0.4	0.5	1.2	0.5	0.7	1.6	0.3	0.3	0.6	7.0	7.4	3.4	4.6	4.6	5.0	0.8	11.4	0.8	7.7	1.8	3.1	1.9	2.5	1.1
45003	45.3N	082.8W	0.5	0.2	0.6	0.1	0.4	0.8	0.6	0.4	2.7	3.3	9.0	4.1	3.9	5.6	8.0	10.9	6.0	3.5	11.0	2.8	3.0	2.1	0.1	10.8
45004	47.2N	086.5W	0.4	2.1	2.7	2.6	3.2	1.2	0.3	0.1	9.8	2.6	0.9	11.3	11.9	1.9	3.0	1.1	0.9	0.2			1.9	0.6	0.8	1.2
45005	41.7N	082.5W	0.4	0.8	1.1	0.5	1.1	1.1	0.8	0.8	0.7	4.2	1.2	10.3	6.6	4.0	8.6	7.5	5.1	0.4	2.8	2.1	3.5	1.1	5.2	1.2
45006	47.3N	090.0W	3.6	1.1	2.4	5.2	3.0	3.6	3.9	1.5	5.6	11.7	6.6	10.8	11.9	11.8	7.1	3.1							2.7	2.6
45007	42.7N	087.1W	1.4	1.5	1.2	0.9	0.7	0.7	0.5	0.3	5.3	7.3	5.5	2.9	6.1	3.9	3.6	2.0	7.1	15.4	3.5	7.2	0.1	3.6	0.8	3.0
45008	44.3N	082.4W	0.7	1.0	1.4	0.9	0.6	0.9	1.7	0.3	6.1	6.6	4.2	8.9	3.5	4.6	7.6	6.8	7.3	3.8	7.3	5.1	2.1	5.2	2.2	10.4
46001	56.3N	148.3W	1.2	0.2	0.2	1.3	1.3	1.3	0.3	0.8	3.4	1.4	2.5	3.5	4.5	7.5	11.0	5.6	6.2	0.9		2.7	9.6	20.8	19.8	1.7
46002	42.5N	130.3W	0.7	1.0	2.0	0.2	0.2	0.4	0.4	0.4	0.7	2.0	0.3	2.1	0.4	3.1	4.0	10.5	9.3	1.9	3.1	2.8	2.3	9.5	13.5	
46003	51.9N	155.7W				0.1	0.2	0.4	0.6	2.3	0.5			0.4	2.0	0.6	0.2	0.8	0.1		3.1	0.5	0.1	3.1	3.6	1.5
46004	50.9N	135.9W	0.4	0.6				0.1	0.6	0.6	4.4	4.5	1.7	0.3	0.3	1.9	3.9	1.6	12.3	3.6	2.6	3.3	5.7	13.3	7.3	12.4
46005	46.1N	131.0W	0.5	0.4	0.2	0.2	0.8	0.3	0.5	0.1	3.1	1.0	1.1	1.0	5.0	6.0	6.4	5.6	15.4	2.6	2.0	3.3	3.0	3.3	9.9	15.9
46006	40.7N	137.7W	0.8	0.5	0.7	0.1	0.1	0.5	0.2	0.1	3.2	2.1	0.7	1.7	0.5	0.9	2.2	1.7	5.5	1.7	7.0	5.4	0.1	2.0	0.7	6.9
46010	46.2N	124.2W	1.5	2.0	1.2	0.4	0.4	0.5	0.5	1.0	12.0	5.6	5.5	1.7	4.1	4.5	3.2	19.3	10.1	1.1	2.0	1.6	9.0	7.6	1.5	6.8
46011	34.9N	120.9W	0.6	0.4	0.3	0.6	0.3	0.6	0.3	0.6	3.6	0.8	1.6	4.1	2.6	3.0	0.8	3.7	0.2	0.2	1.2	0.3	0.6	0.4	30.6	
46012	37.4N	122.7W	1.5	0.4	0.4	0.3	0.3	0.5	1.7	0.3	3.9	0.9	0.6	3.5	4.1	2.6	3.0	2.1	5.1	0.2	0.2	0.3	0.6	0.4	36.1	
46013	38.2N	123.3W	3.2	1.1	1.5	2.0	0.6	1.5	0.6	1.3	4.9	1.5	3.7	4.6	5.5	5.2	3.0	4.0	9.6	5.4	2.5	15.9	8.0	2.1	5.0	4.6
46014	39.2N	124.0W	1.3	1.0	2.0	0.7	0.6	0.9	1.0	1.2	9.0	3.3	4.9	3.5	3.6	4.0	5.1	5.1	<.05	1.0	9.0	0.1	1.9	1.0	21.4	
46015	43.3N	170.3W					1.0				2.1	0.3	0.7	1.3	2.2	1.5	1.1	2.3	0.6		2.3	0.4	0.2	1.1	2.4	0.8
46017	60.3N	172.3W	1.1	1.0	0.7	1.0	0.3	0.5		0.1	3.6	0.7	7.4	3.2	1.9	3.6	1.7	0.4	2.0	7.9	4.7	0.6	0.6	15.2	2.4	0.5
46019	57.2N	170.3W				0.7	0.3	0.6			0.3	0.4		2.2	1.1	0.5	2.1	1.0	12.3	1.9	0.5	1.2	0.5	0.7	17.5	12.3
46020	55.9N	168.0W					0.1	0.2	0.4	0.6	2.3	0.5		1.2	3.5	0.6	1.8	1.2	4.8	0.8	1.0	0.8	0.3	11.6	10.3	4.1
46022	40.8N	124.5W	0.9	1.6	1.1	1.2	0.7	0.9	1.0	0.6	6.5	5.8	4.8	5.6	3.1	3.1	2.8	0.5	19.7	0.7	1.1	0.5	7.8	2.0	0.5	4.5
46023	34.3N	120.7W	0.4	<.05	0.2	0.3	0.3	1.6	0.9		3.0	<.05	0.8	5.5	2.6	3.0	4.5	1.3	7.9		0.4	0.8	2.4	1.2	1.2	36.2
46024	32.8N	119.2W	0.4	0.5	0.3	0.4	0.5	0.8	1.3	0.7	1.1	0.3	0.2	2.1	0.6	1.2	1.2	0.4	3.1	0.2	0.2	0.2	0.2	0.2	1.1	38.2
46025	33.6N	119.0W	1.3	0.8	1.1	1.2	1.6	1.5	2.3	1.4	2.7	0.8	0.8	1.1	5.7	5.7	19.9	10.3	0.1	0.3	0.3	0.1	1.1	1.8	12.9	12.9
46026	37.8N	122.7W	1.2	0.5	0.6	0.6	1.0	0.9	1.6	1.5	1.7	2.7	1.3	0.6	1.5	1.4	0.8	0.7	0.9	0.2	0.6	1.5	0.7	0.3	11.7	21.5
C58F1	29.7N	085.9W	1.5	4.7	3.0	0.4	0.6	1.1	1.4	2.5	1.7	2.2	1.2	1.3	2.6	1.1	0.8	0.3	1.2	0.3	0.4	0.2	0.1	0.4	0.1	0.2
DBLN6	42.6N	079.5W	0.5	1.3	1.6	2.0	2.3	1.6	1.0	0.5	1.0	5.1	0.2	0.4	0.1	0.1	3.6	1.7	2.0	7.9	3.1	0.2	1.6	17.8	9.6	9.1

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BUOY	LAT	LONG	% FREQUENCY OF WIND SPEEDS (22- 33 KTS) N	NE	E	SE	S	SW	W	NW	% FREQUENCY OF WIND SPEEDS (34-47 KTS) N	NE	E	SE	S	SW	W	NW	% FREQUENCY OF WIND SPEEDS (>47 KTS) N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.3			1.7	6.3	4.5	9.1	3.6				0.4	1.2	0.1	0.7	0.6								
41002	32.3N	075.1W					1.8	0.5	2.7	0.9																
41006	29.3N	077.3W				<.05	1.2	0.7	1.8	0.1																
42001	25.9N	089.7W	3.6	0.1		11.4	1.8			2.8																
42002	26.0N	093.5W	2.7	3.3		6.7	1.0			0.7																
42003	26.0N	085.9W	0.8			2.0	2.2																			
42007	30.1N	088.9W	0.9			0.2	1.2	0.4	3.2	0.8																
42008	28.7N	095.1W	2.0	<.05			0.8	0.1	0.3	1.0																
42009	29.3N	087.5W	0.3			0.7	0.3	0.4	2.9	0.3																
42011	29.6N	093.5W				1.4		0.9	5.6	3.5																
44003	40.8N	068.5W	0.1	1.1	0.4	1.5	0.7	0.3		1.0	0.7	0.6						0.6								
44004	38.5N	070.7W	1.3	0.7	0.8	0.8	1.5	5.5	1.7	0.1	1.0	0.3						0.5								
44005	42.7N	068.7W	2.6		0.9	1.8	0.1			0.5																
44007	43.5N	070.1W			1.0	0.4																				
44008	40.5N	069.4W	2.5	3.5	1.6	0.8				2.2	4.6	0.1						0.1								
45001	48.0N	087.6W																								
45002	45.3N	086.3W		0.1	0.6		1.2	<.05																		
45003	45.3N	082.8W		<.05	1.4	0.9	0.8		0.2	0.2																
45004	47.2N	086.5W																								
45005	41.7N	082.5W	0.2							1.2																
45006	47.3N	090.0W																								
45007	42.7N	087.1W		0.5	1.9		0.1	1.0	0.1																	
45008	44.3N	082.4W		0.1	0.7	1.0																				
46001	56.3N	148.3W			1.0	1.6	0.7																			
46002	42.5N	130.3W		0.9	0.3	0.1	1.1	0.9	1.3	0.2																
46003	51.9N	155.7W			0.1	0.3	7.4	10.9	11.3	3.3			0.7	0.6	0.3	1.3		0.1								
46004	50.9N	135.9W	3.4		0.7	4.2	4.9	0.7	3.5	1.0			0.1	0.3												
46005	46.1N	131.0W				0.4	2.2	1.3	2.1	0.8					0.3	0.1		0.1								
46006	40.7N	137.7W	10.3	5.3			1.2	1.9	0.3	5.3						0.3	0.1									
46010	46.2N	124.2W				<.05	0.2																			
46011	34.9N	120.9W	0.5		0.2	1.8	0.2	0.2		0.8																
46012	37.4N	122.7W				0.8	0.1			0.4																
46013	38.2N	123.3W				0.2	0.2			1.9																
46014	39.2N	124.0W	3.0			0.8	2.0	0.2		0.2								0.3								
46015	43.3N	170.3W		11.2	2.4	2.2					3.1	0.8	0.5							0.8						
46017	60.3N	172.3W		5.2	2.9	3.0	5.9	0.5					1.9													
46019	57.2N	170.3W	0.8	3.0		1.9	1.8	1.9	2.4																	
46020	55.9N	168.0W	0.7			5.1	2.5	2.9	3.2	2.2																
46022	40.8N	124.5W	11.9	0.2	0.1	1.5	3.1	0.4		0.8																
46023	34.3N	120.7W	2.2			0.2				2.9																
46024	32.8N	119.2W	0.2			0.7				10.2								0.8								
46025	33.6N	119.0W		0.3					2.2	2.2																
46026	37.8N	122.7W								2.0																
C58F1	29.7N	085.9W				<.05	0.1	0.4	1.9	0.1																
DBLN6	42.6N	079.5W		0.8		1.4		0.3	1.1	0.6																

MAY 1983			AIR TEMPERATURE (DEG C)								SEA TEMPERATURE (DEG C)								AIR-SEA TEMPERATURE DIFFERENCE (DEG C)							
BUOY#	LAT	LONG	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN		OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN		OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	
41001	34.9N	072.9W	742	31	22.9131	20	15.0118	10	19.5		743	31	24.4123	21	19.2101	03	21.0		743	31	01.8115	05	-04.9113	08	-01.5	
41002	32.3N	075.3W	743	31	24.6127	15	18.2106	16	22.2		743	31	25.7111	20	21.2106	16	24.0		743	31	01.0131	21	-05.3124	16	-01.8	
41006	29.3N	077.7W	744	31	26.6125	21	20.8104	22	23.5		744	31	27.8124	21	23.1101	11	26.1		744	31	00.9104	18	-02.9113	10	-01.1	
42001	25.9N	089.7W	744	31	27.9124	22	22.0104	11	25.9		744	31	28.8124	21	23.1101	11	25.1		744	31	02.7112	17	-04.3130	02	00.7	
42002	26.0N	093.5W	743	31	26.9125	22	21.4105	11	24.8		743	31	27.8124	22	23.3101	01	25.1		743	31	01.0114	14	-03.1129	03	-00.3	
42003	26.0N	085.9W	248	10	28.7124	18	20.6104	15	25.2		248	10	29.0124	18	25.9101	00	27.2		248	10	00.0103	21	-05.7104	15	-02.0	
42007	30.1N	088.9W	743	31	27.2126	18	17.4109	12	23.5		744	31	29.0130	19	20.6101	02	25.9		744	31	01.8119	23	-04.7109	12	-00.4	
42008	28.7N	095.3W	741	31	25.2129	19	15.6116	06	22.2		744	31	27.3131	22	19.2101	03	22.6		744	31	02.4103	08	-06.9116	06	-00.4	
42009	29.3N	087.5W	743	31	26.3129	15	17.2103	20	22.7		743	31	27.5128	22	20.1101	07	23.0		743	31	01.2102	15	-03.9103	20	-00.4	
44003	40.8N	068.5W	744	31	14.2131	14	06.3115	12	09.8		744	31	09.2129	16	06.6101	00	08.1		744	31	05.8104	17	-01.7115	12	01.8	
44004	38.5N	070.0W	744	31	21.1131	21	09.6118	00	15.1		744	31	20.5131	21	14.7106	10	16.7		744	31	03.1116	02	-06.9118	00	01.6	
44005	42.7N	068.3W	744	31	10.9109	10	04.4117	11	08.5		739	31	09.4123	00	06.7101	05	07.7		744	31	03.8101	15	-03.2117	10	00.8	
44007	43.5N	070.1W	742	31	16.1102	02	04.5110	06	09.4																	
45001	48.0N	087.6W	209	10	06.9129	22	02.5125	11	04.4		214	10	03.1127	18	02.2101	00	02.8		740	31	04.1129	22	-00.3125	11	00.9	
45002	45.3N	080.9W	740	31	08.8113	07	01.1115	19	05.1		744	31	09.0128	21	03.1101	08	05.9		744	31	05.2113	07	-02.6115	19	01.2	
45003	45.3N	082.8W	743	31	07.8125	02	00.3109	14	04.5		743	31	09.4131	20	03.0101	01	05.4		743	31	04.2125	02	-02.8109	14	01.1	
45004	47.2N	086.5W	722	31	08.8113	07	00.1104	19	03.9		741	31	02.9127	19	02.0101	10	02.5		741	33	06.4113	07	-02.4115	23	01.3	
45005	41.7N	082.5W	744	31	18.0114	20	04.0105	13	11.1		737	31	14.7129	00	06.2101	05	10.4		744	31	04.6102	17	-05.2126	11	00.7	
45006	47.3N	090.0W	715	31	21.1118	20	09.6118	00	15.1		744	31	20.5131	21	14.7106	10	16.7		744	31	03.1116	02	-06.9118	00	01.6	
45007	42.7N	087.1W	743	31	11.5125	03	02.8108	18	06.8		744	31	08.1131	21	03.9109	09	05.1		744	31	05.6107	01	-01.3108	18	01.7	
45008	44.3N	082.4W	740	31	10.2129	23	01.0109	16	05.1		743	31	05.4128	20	02.6102	04	03.5		743	31	04.3102	17	-01.8109	16	01.7	
46011	56.3N	148.3W	744	31	09.0109	03	02.8105	06	06.9		744	31	09.0109	00	06.6103	08	07.5		744	31	05.8108	21	-04.3105	06	-00.6	
46022	42.5N	130.3W	741	31	14.1128	02	08.0108	07	11.1		741	31	14.2128	05	11.2108	11	12.1		741	31	01.2128	02	-03.4103	14	-01.0	
46035	51.9N	155.7W									741	31	07.6129	03	04.9107	11	06.0									
46066	50.9N	135.9W	743	31	11.1130	01	05.4107	06	08.3		744	31	09.6123	21	07.2107	15	08.2		744	31	01.9119	05	-02.1107	06	00.1	
46005	46.1N	131.0W	742	31	13.0130	00	06.1108	04	09.7		743	31	13.8128	23	09.5101	11	11.1		743	31	00.6130	00	-00.4108	04	-01.4	
46061	40.7N	127.7W	740	31	15.9125	19	09.2102	12	11.8		740	31	16.3126	01	10.2101	10	11.8		740	31	02.5125	19	-02.8119	10	00.2	
46100	46.2N	124.2W	070	03	12.1103	21	09.1102	13	10.3		070	03	12.9102	00	11.9101	13	12.4		070	03	-00.6103	21	-03.2102	05	-02.1	
46111	34.9N	120.9W	739	31	13.8105	21	10.5119	15	12.4		739	31	15.3121	00	11.9111	06	13.3		739	31	00.6129	12	-03.2120	05	-00.9	
46121	37.4N	122.7W	257	12	13.8130	02	10.5127	15	12.1		257	12	13.4128	03	12.2126	16	12.7		741	31	01.1130	21	-02.4127	16	-00.6	
46131	38.2N	123.3W	740	31	13.9108	01	11.0126	10	12.0		740	31	14.6106	22	09.5118	18	11.8		740	31	03.4120	18	-01.8105	02	00.2	
46146	39.2N	124.0W	629	29	15.2120	23	09.0122	14	12.0		631	29	15.1108	00	10.1119	13	12.0		740	31	03.0120	14	-02.8107	14	00.0	
46161	63.3N	170.3W	112	23	07.0130	03	00.1101	08	01.5																	
46171	60.3N	172.3W	175	25	08.5119	00	00.1101	12	02.0																	
46191	57.2N	170.2W	219	30	06.1121	21	05.1105	09	02.4																	
46201	55.9N	168.0W	245	31	06.2118	00	00.2107	15	04.0		247	31	05.8115	06	03.9101	09	04.9		248	31	01.3112	21	-03.7107	15	-00.9	
46221	40.8N	124.5W	742	31	15.5130	03	08.8109	08	11.6		742	31	13.8130	01	10.6126	17	12.2		742	31	02.2130	03	-03.5109	08	-00.6	
46231	34.3N	120.7W	739	31	14.7101	01	11.5115	15	13.1		739	31	15.3120	21	11.1116	17	13.4		740	31	02.0116	01	-02.7101	18	-00.3	
46244	32.8N	119.2W	739	31	14.6117	20	12.7103	13	14.1		739	31	16.7127	18	14.3115	09	15.2		739	31	01.6116	02	-03.3126	15	-01.1	
46251	33.6N	119.0W	739	31	18.6118	20	13.3101	09	15.3		739	31	18.4120	19	15.2113	08	16.7		739	31	01.2118	07	-03.7120	02	-01.4	
46262	37.8N	122.7W	739	31	19.2120	01	09.9110	14	12.0		739	31	15.6106	21	10.3116	14	13.2		739	31	04.9120	01	-03.6110	15	-01.2	
CSBF1	29.7N	085.4W	743	31	26.2126	16	16.0117	10	22.6																	
DBLN6	42.6N	070.5W	741	31	23.8102	18	02.0109	13	10.9																	

MAY 1983			PRESSURE (MB)								WIND SPEEDS (KNOTS)					MEAN WIND SPEED (KNOTS)								
BUOY#	LAT	LONG	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN		OBS	MAX	DY HR	DIR		N	NE	E	SE	S	SW	W	NW	TOTAL
41001	34.9N	072.9W	742	31	1032.3119	04	1007.2105	00	1019.0	734	734	30117	01	190		11.9	10.5	11.2	12.5	16.8	16.5	10.9	8.3	14.2
41002	32.3N	075.3W	743	31	1028.9119	03	1005.7131	21	1018.4	741	740	22117	01	040		7.3	12.2	10.2	8.8	9.7	13.1	13.2	10.1	11.1
41006	29.3N	077.7W	744	31	1025.5120	03	1006.7131	11	1017.5	739	739	21104	20	335		7.8	7.1	8.3	7.9	9.9	10.3	6.5	8.6	08.8
42001	25.9N	089.7W	744	31	1019.0106	15	1006.0131	10	1018.2	738	738	36108	21	070		13.1	10.7	11.6	14.9	11.9	5.0	3.9	5.3	13.0
42002	26.0N	093.5W	743	31	1019.3105	16	1005.0103	08	1013.3	740	740	36104	09	030		16.0	12.6	10.4	14.3	14.2	6.4	7.0	5.2	12.9
42003	26.0N	085.9W	248	31	1019.5106	15	1008.8130	12	1015.3	246	246	24104	15	360		9.1	7.7	12.7	13.5	10.8	7.0	7.0	5.2	11.2
42007	30.1N	088.9W	743	31	1021.4106	17	1006.1131	09	1015.1	739	739	26116	06	220		10.0	11.4	10.1	11.5	13.4	10.3	8.9	10.6	11.5
42008	28.7N	095.3W	740	31	1018.6104	16	1003.9102	22	1012.7	737	737	36120	07	140		12.6	12.2	12.7	13.4	11.6	6.2	5.8	10.4	12.6
42009	29.3N	087.5W	743	31	1020.7106	16	1006.2131	01	1018.3	737	737	25108	22	010		7.7	9.5	7.8	10.0	10.1	6.6	7.0	7.0	08.1
42011	29.6N	093.5W	736	31	1020.5110	18	1006.7131	09	1013.5	742	742	35120	21	010		11.3	11.4	11.5	15.3	11.9	8.9	6.0	9.8	12.5
44003	40.8N	068.5W	744	31	1035.4119	13	1000.6104	21	1016.2	738	738	27117	08	360		11.4	6.1	9.4	6.8	10.3	9.5	9.3	11.0	09.9
44004	38.5N	070.7W	744	31	1034.8119	12	1002.6104	15	1017.0	731	731	28117	03	230		9.1	8.2	9.1	9.4	13.2	12.9	10.6	12.2	11.5
44005	42.7N	068.3W	744	31	1034.0119	16	997.4104	20	1015.5	735	734	26117	12	340		12.5	10.6	12.9	10.0	12.2	9.9	8.1	9.8	10.9
44007	43.5N	070.1W	744	31	1033.0119	17	996.8104	20	1015.2	733	732	22103	01	210		9.2	10.8	9.4	8.5	12.6	11.4	9.1	6.8	10.1
45001	48.0N	087.6W	573	27	1020.8101	12	1001.8130	13	1012.6	728	728	23104	14	335		9.9	10.5	6.4	7.7	6.5	5.8	7.2	10.1	08.6
45002	45.3N	086.3W	744	31	1030.0109	16	996.9102	16	1014.3															
45003	45.3N	082.8W	743	31	1028.1109	16	991.6102	18	1013.5	735	735	25108	04	030		13.1	14.8	10.5	7.2	6.9	6.4	6.4	12.1	12.1
45004	47.2N	086.5W	741	31	1031.3109	13	997.4110	13	1015.2	729	729	28104	15	320		9.3	9.5	7.2	7.7	6.8	7.0	5.8	11.0	08.7
45005	41.7N	082.5W	743	31	1028.5110	15	997.3102	20	1013.9	741	741	23108	12	350		12.6	9.6	7.6	6.4	9.4	9.0	9.5	9.2	09.1
45006	47.3N	090.0W	743	31	1030.9108	16	1003.0104	04	1015.4	733	733	17107	11	050		7.8	8.2	5.7	5.6	6.8	6.8	6.4	6.2	06.8
45007	42.7N	087.1W	743	31	1029.3109	16	993.6102	10	1013.8	734	734	29102	03	110		11.5	6.8	7.4	7.4	8.0	7.9	7.4	8.1	08.2
45008	44.3N	082.4W	743	31	1028.7118	15	993.9102	17	1013.4	728	728	29108	03	020		11.4	8.3	7.4	8.2	7.3	7.9	8.3	11.2	08.7
46011	56.3N	148.3W	744	31	1022.9120	20	998.4127	04	1009.5	728	728	23110	12	130		7.7	6.0	10.6	14.6	10.7	11.2	12.0	9.0	11.4
46022	42.5N	130.3W	741	31	1032.1119	06	1003.5105	13	1021.0	696	696	28105	19	300		12.8	12.1	3.3	2.2	10.5	8.9	13.0	12.6	11.7
46023	51.9N	155.7W	741	31	1028.7101	04	990.7126	21	1008.5	737	737	29106	21	310		10.0	10.2	12.5	16.2	13.4	11.5	11.7	13.7	13.5
46035	51.9N	155.7W	741	31	1031.6107	07	1000.8130	01	1016.1	734	734	28130	21	150		7.7	9.8	8.1	10.7	16.1	13.0	11.4	11.0	13.5
46059	50.9N	129.9W	740	31	1033.1119	07	1009.4107	01	1020.7	740	740	21106	19	190		13.0	4.7	4.3	7.9	10.0	10.8	11.6	11.8	11.1
46066	40.7N	137.7W	740	31	1036.1118	21	1001.7129	00	1024.0	736	736	30105	15	280		10.2	11.3	13.5	9.8	10.4	12.8	14.4	12.8	13.2
46100	46.2N	124.2W	070	03	1027.6103	06	1013.7101	00	1022.4	067	067	24102	06	245				2.0	4.3	7.9	7.6	6.6	8.9	07.4
46101	46.2N	124.2W	070	03	1027.6103	06	1013.7101	00	1022.4	067	067	24102	06	245				2.0	4.3	7.9	7.6	6.6	8.9	07.4
46011	34.9N	072.9W	742	31	1025.0102	18	1007.7131	12	1015.3	737	737	29109	02	320		11.1	2.0	5.4	6.5	6.9	6.4	5.3	15.5	14.2
46121	37.4N	122.7W	601	27	1020.8101	19	1009.1131	13	1016.1	696	696	27110	01	310		7.9	2.0	3.0	6.3	8.6	9.2	6.8	12.3	11.3
46131	38.2N	123.3W	740	31	1027.1102	19	1008.6131	23	1017.4	725	725	30110	04	310		9.0	3.6	4.3	3.9	7.4	6.8	9.0	17.0	14.2
46146	39.2N	124.0W	652	29	1024.9103	16	1008.6131	22	1017.7	579	579	30110	00	320		9.0	4.9	4.9	6.7	7.6	5.7	6.3	18.4	13.1
46161	63.3N	170.3W	112	23	1020.2112	03	1000.8130	15	1011.2	248	248	28117	03	050		6.2	15.2	8.7	8.4	7.3	5.7	9.8	7.3	12.4
46171	60.3N	172.3W	247	31	1019.4107	09	997.3130	15	1008.6	243	243	26111	12	140		7.0	9.7	9.8	11.4	8.3	6.9	6.4	6.1	08.9
46191	57.2N	170.2W	247	31	1018.3107	09	990.1130	15	1006.9	246	246	22129	00	130		9.0	9.8	10.9	12.8	9.0	8.6	6.3	8.5	09.9
46201	55.9N	168.0W	068	09	1019.6127	18	987.0130	06	1001.6	244	244	27129	06	110		12.9	11.1	12.2	12.3	14.4	9.3	12.0	11.5	12.1
46202	40.8N	124.5W	742	31	1027.4102	20	1007.8105	14	1017.1	733	733	30131	13	330		14.7	7.4	3.8	12.5	10.9	9.4	8.3	11.0	12.6
46231	34.3N	120.7W	739	31	1023.7102	18	1006.4131	12	1014.6	737	737	30109	01	320		17.9		5.0	9.3	3.2	7.6	7.0	17.8	17.2
46244	32.8N	119.2W	739	31	1024.6102	19	1007.3131	13	1015.3	737	737	28110	19	310		4.9					5.4	8.9	15.9	15.0
46251	33.6N	119.0W	739	31	1023.3102	19	1006.4131	11	1014.3	715	715	28110	20	290		8.3	3.9	3.4	4.6	3.2	5.1	8.0	21.0	07.4
46262	37.8N	122.7W	739	31	1027.6102	19	1006.6131	18	1017.4	728	728	29110	08	320		4.1	2.4	3.0	6.9	7.5	6.9	7.9	13.7	11.6
CSBF1	29.7N	085.4W	744	31	1022.9111	16	1006.8131	08	1016.5	744	744	19116	15	210		4.2	3.4	6.3	5.6	6.7	6.7	9.5	4.5	06.2
DBLN6	42.6N	070.5W	744	31	1030.3118	21	996.9103	20	1013.9	744	744	28131	20	240		9.4	7.9	9.1	8.9	7.5	14.7	10.6	10.4	10.5

MAY 1983			WAVE HEIGHTS (METERS)					FREQUENCY OF WAVE HEIGHTS (%)						
BUOY#	LAT	LONG	OBS	MAX	DY	HR	MEAN	<1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	742	3.0	17	05	1.4	4.1	72.2	23.1	0.4				
41002	32.3N	075.3W	742	3.0	04	11	1.5	2.6	65.4	28.8	3.9				
41006	29.3N	077.7W	741	3.0	18	02	1.3	6.7	77.5	12.5	3.1				
42001	25.9N	089.7W	736	3.0	09	00	1.2	25.1	58.6	14.0	0.1				
42002	26.0N	093.5W	743	3.0	15	21	1.4	14.1	69.2	14.3	0.2				
42003	26.0N	085.9W	574	1.5	08	18	0.7	57.4	42.5						
42009	29.3N	087.5W	658	2.0	08	13	1.0	31.4	61.2	7.2					
44003	40.8N	068.5W	740	4.0	17	13	1.4	9.4	68.1	18.5	3.5	0.4			
44004	38.5N	070.7W	743	4.0	17	09	1.3	7.1	75.9	14.2	2.5	0.1			
44005	42.7N	068.3W	742	4.5	17	14	1.4	6.4	44.2	25.7	2.8	0.6			
44007	43.5N	070.1W	744	2.5	04	07	1.0	31.9	58.3	9.6					
45001	48.0N	087.6W	639	2.5	04	14	0.8	52.7	40.8	6.4					
45002	45.3N	086.5W	455	2.0	02	23	0.8	52.7	33.6	4.1					
45003	45.3N	082.8W	530	2.5	02	11	0.9	47.1	41.3	11.5					
45005	41.7N	082.5W	623	2.5	08	12	0.8	44.9	52.8	2.2					
45006	47.3N	090.0W	577	2.5	07	12	0.7	64.9	30.1	4.8					
45007	42.7N	087.1W	214	2.5	25	15	0.6	87.8	9.3	2.8					
45008	44.3N	082.4W	579	3.5	06	06	0.9	47.1	43.6	6.5	2.4				
46011	56.3N	148.3W	744	5.5	10	21	2.2		31.5	43.8	20.2	4.3			
46022	42.5N	130.3W	741	4.5	08	11	1.7	0.4	54.7	35.2	8.0	1.4			
46023	51.9N	155.7W	741	4.5	04	00	1.9		21.7	54.9	17.0	5.9			
46035	50.9N	129.9W	743	4.5	30	18	1.9	2.6	39.5	44.8	11.5	1.3			
46059	46.1N	131.0W	742	3.5	08	07	1.5	1.0	67.3	27.2	4.3				
46066	40.7N	137.7W	740	4.5	07	22	1.7	0.8	54.7	31.8	10.2	2.2			
46100	46.2N	124.2W	070	1.5	01	00	1.0	97.1	2.9						
46011	34.9N	072.9W	737	4.5	09	02	1.7	11.6	43.8	29.7	10.5	4.2			
46121	37.4N	122.7W	740	5.0	31	13	1.8	5.2	51.8	26.3	11.3	5.1			
46131	38.2N	123.3W	740	4.5	31	09	1.9	2.0	45.0	32.1	17.2	3.5			
46146	39.2N	124.0W	100	4.0	31	03	1.5	27.0	44.0	4.0	21.0	2.0			
46221	40.8N	124.5W	741	4.5	19	06	1.8	4.8	42.9	40.2	11.4	0.5			
46231	34.3N	120.7W	737	5.0	10	19	2.0	2.7	43.5	34.7	11.3	7.5			
46244	32.8N	119.2W	739	4.5	10	07	1.8	3.1	49.1	34.6	8.3	4.7			
46251	33.6N	119.0W	732	4.5	10	22	1.8	14.8	73.7	10.9	1.2				
46262	37.8N	122.7W	739	3.5	10	08	1.3	28.7	48.4	20.4	2.4				

MAY 1983

TOTAL FREQUENCY OF WIND SPEEDS (%)

BUOY	LAT	LONG	CALM	1-3KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT
41001	34.9N	072.9W		4.2	23.7	58.4	13.6		
41002	32.3N	075.3W		4.7	18.0	57.2	0.1		
41006	29.3N	077.7W		8.8	57.9	33.3			
42001	25.9N	089.7W		3.1	30.5	59.0	7.2	0.1	
42002	26.0N	093.5W		1.6	32.4	48.4	0.5		
42003	26.0N	085.9W	2.0	8.9	33.5	56.9	0.8		
42007	30.1N	088.9W		3.1	38.4	57.6	0.8		
42008	28.7N	095.3W		3.7	31.5	60.9	3.8	0.1	
42009	29.3N	087.5W		6.5	46.1	47.1	0.3		
42011	29.6N	093.5W	0.7	7.7	31.5	56.9	3.0	0.1	
44003	40.8N	068.5W		9.8	44.4	44.9	1.1		
44004	38.5N	070.7W		5.1	33.9	60.3	0.7		
44005	42.7N	068.3W		5.6	44.9	48.8	1.5		
44007	43.5N	070.1W		5.5	46.2	50.1	0.3		
45001	48.0N	087.6W		5.9	49.2	39.5	0.4		
45003	45.1N	082.8W		7.1	52.2	37.0	3.7		
45004	47.2N	086.5W		8.4	62.4	29.1			
45005	41.7N	082.5W		10.0	54.3	35.4	0.4		
45006	47.3N	090.0W		14.2	74.4	11.5			
45007	42.7N	087.1W		9.4	69.4	20.7	1.1		
45008	44.3N	082.4W		10.9	57.7	30.5	1.0		
46011	34.9N	120.9W		11.4	30.9	53.4	4.3		
46012	37.4N	122.7W		4.7	45.5	48.5	5.3		
46013	38.2N	123.3W		8.1	27.7	45.5	18.6		
46014	39.2N	124.0W		7.1	25.6	45.3	22.1		
46022	40.7N	124.5W		3.1	20.1	62.6	14.2		
46025	33.8N	119.0W		9.2	26.6	61.0	3.2		
46026	37.8N	122.7W		6.1	27.7	56.9	11.3		
46027	41.8N	124.4W		6.0	85.1	9.0			
46028	35.7N	121.9W		2.4	28.0	55.5	14.1		
46042	36.8N	122.4W		4.7	45.5	40.4	5.3		
46047	32.4N	119.5W		1.5	10.4	64.0	24.0		
46053	34.2N	119.8W		2.4	19.8	65.7	12.1		
46054	34.3N	120.5W		1.4	10.4	64.0	24.0		
46059	38.0N	129.9W		22.2	55.0	22.1	0.7		
46060	60.6N	146.8W		5.2	40.8	48.5	5.5		
CSBF1	29.7N	085.4W	6.0	20.3	67.1	12.6			
DBLN6	42.6N	079.5W	0.8	9.7	47.3	36.7	6.3		

TOTAL FREQUENCY OF WIND DIRECTIONS (%)

BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	10.2	8.4	5.8	8.4	38.3	15.5	2.9	4.5
41002	32.3N	075.3W	1.6	9.4	14.7	17.0	18.0	31.4	5.5	2.5
41006	29.3N	077.7W	3.7	7.3	23.3	21.0	30.1	9.3	2.2	3.0
42001	25.9N	089.7W	4.4	12.2	25.3	47.1	9.4	0.7	0.5	0.4
42002	26.0N	093.5W	2.1	9.2	28.5	53.8	4.9	0.7	0.6	0.5
42003	26.0N	085.9W	14.0	13.8	30.7	30.5	9.3	2.9	1.2	2.5
42007	30.1N	088.9W	7.0	5.8	5.9	21.5	31.7	14.2	8.3	7.6
42008	28.7N	095.3W	7.6	11.3	27.1	38.6	11.7	0.9	0.6	2.3
42009	29.3N	087.5W	7.2	6.1	8.9	39.2	11.1	9.0	9.9	8.6
42011	29.6N	093.5W	7.7	11.5	16.2	34.9	21.6	3.9	0.5	4.9
44003	40.8N	068.5W	9.8	5.0	5.3	8.1	28.8	20.8	11.6	13.6
44004	38.5N	070.7W	9.1	3.7	3.9	10.0	28.1	15.9	13.9	15.5
44005	42.7N	068.3W	14.9	5.2	5.0	6.9	29.9	20.0	7.0	11.1
44007	43.5N	070.1W	13.2	9.5	7.1	7.5	27.2	24.4	6.3	4.8
45001	48.0N	087.6W	17.7	17.2	9.9	20.7	7.2	5.5	0.4	13.7
45003	45.1N	082.8W	6.4	3.5	17.1	14.2	14.0	8.1	23.7	13.0
45004	47.2N	086.5W	17.4	16.0	12.7	14.3	9.5	4.2	5.3	20.4
45005	41.7N	082.5W	6.7	11.4	16.8	10.3	17.9	17.4	11.6	7.8
45006	47.3N	090.0W	10.8	29.4	18.4	12.6	5.0	7.4	7.7	8.7
45007	42.7N	087.1W	20.3	9.8	19.3	14.9	12.7	12.3	10.0	5.7
45008	44.3N	082.4W	10.4	5.6	13.8	19.2	13.6	10.2	13.2	13.9
46011	34.9N	120.9W	6.7	6.3	13.5	21.0	12.8	18.7	10.6	2.5
46012	37.4N	122.7W	19.0	10.2	2.0	1.7	0.0	0.8	17.9	28.6
46013	38.2N	123.3W	10.5	0.7	1.8	4.1	15.3	16.4	22.6	28.7
46014	39.2N	124.0W	7.2	0.7	0.1	2.6	15.1	18.1	22.5	17.6
46022	40.7N	124.5W			1.5	4.5	12.3	40.7	29.1	11.9
46025	33.8N	119.0W	12.7	0.1	0.2	1.0	2.7	8.9	2.8	79.0
46026	37.8N	122.7W	3.1	0.2	0.4	2.0	3.6	2.7	0.8	80.5
46027	41.8N	124.4W	0.8	0.2	1.0	2.0	4.4	2.3	20.8	68.6
46028	35.7N	121.9W	19.8	2.2	0.4	2.0	0.8	5.7	5.3	55.1
46042	36.8N	122.4W	2.2	60.3	15.9	7.0	2.4	2.6	0.9	4.6
46047	32.4N	119.5W	6.6	28.3	29.0	16.4	2.4	7.8	11.2	3.4
46053	34.2N	120.5W	10.3	13.3	12.5	9.9	11.0	5.7	3.4	4.0
46054	34.3N	120.4W	17.9	18.1	22.1	14.5	9.7	3.0	5.5	9.2
46059	38.0N	129.9W	55.5	3.3	0.5	1.2	13.5	10.6	0.6	10.8
46060	60.6N	146.8W	5.4	3.9	13.4	31.0	17.5	11.9	10.7	6.0
CSBF1	29.7N	085.4W	8.6	3.9	13.4	31.0	17.5	11.9	10.7	6.0
DBLN6	42.6N	079.5W	7.3	11.9	3.5	13.5	19.6	31.4	12.2	4.8

MAY 1983

FREQUENCY OF WIND SPEEDS (<4 KTS)

BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.3	0.5	0.4	0.6	0.6	0.6	0.2	0.9
41002	32.3N	075.3W	0.3	0.6	0.9	1.3	1.1	0.3		0.2
41006	29.3N	077.7W	0.3	0.6	2.7	3.2	0.8	0.3	0.3	0.5
42001	25.9N	089.7W	0.4	0.3	0.2	0.8	0.9	0.2	0.2	0.2
42002	26.0N	093.5W		0.2	0.5	0.9	0.3			0.3
42003	26.0N	085.9W	0.4	0.8	0.4	1.2	0.3	0.8	0.8	1.0
42007	30.1N	088.9W	0.1	0.1	0.1	0.4	0.7	0.5	0.5	0.6
42008	28.7N	095.3W	0.3	0.3	0.6	1.3	0.5	<.05	0.1	0.4
42009	29.3N	087.5W	1.2	0.4	0.9	1.5	0.2	0.7	0.7	0.8
42011	29.6N	093.5W	0.4	1.1	1.1	0.6	1.2	0.8	0.1	0.3
44003	40.8N	068.5W	1.1	1.2	1.0	0.6	1.4	1.7	1.0	0.6
44004	38.5N	070.7W	1.1	0.6	0.3	0.4		0.9	0.9	0.8
44005	42.7N	068.3W	0.3	0.3	0.2	0.9	0.3	1.0	0.5	0.3
44007	43.5N	070.1W	0.4	0.3	0.3	0.6	1.4	0.9	0.7	0.5
45001	48.0N	087.6W	0.5	0.3	1.5	0.9	0.8	1.1	0.5	0.3
45003	45.1N	082.8W	0.6	<.05	0.6	1.7	1.7	1.0	0.9	0.4
45004	47.2N	086.5W	0.9	1.2	1.0	0.8	1.4	0.8	0.4	0.6
45005	41.7N	082.5W	0.2	1.0	2.9	1.7	1.2	0.9	0.9	0.7
45006	47.3N	090.0W	1.6	2.0	3.4	1.9	1.6	0.9	1.3	1.4
45007	42.7N	087.1W	1.2	0.9	1.7	1.4	0.7	1.3	0.1	1.2
45008	44.3N	082.4W	0.7	0.8	1.8	2.3	1.5	1.8	1.1	0.8
46011	34.9N	120.9W	0.2	0.1		0.3	0.2	0.8	0.1	0.1
46012	37.4N	122.7W	0.1	0.2	0.3	0.4	0.4		1.6	1.8
46013	38.2N	123.3W	0.2	0.1	0.4	0.7	0.7	0.8	1.2	1.4
46014	39.2N	124.0W	0.5		<.05	0.5	0.5		1.1	1.1
46022	40.7N	124.5W		0.9	0.4					
46025	33.8N	119.0W				0.8				
46026	37.8N	122.7W				1.2				
46027	41.8N	124.4W	7.8							
46028	35.7N	121.9W	3.1							
46042	36.8N	122.4W								
46047	32.4N	119.5W								
46053	34.2N	120.5W								
46054	34.3N	120.4W								
46059	38.0N	129.9W				0.3		5.8	0.2	
46060	60.6N	146.8W								
CSBF1	29.7N	085.4W								
DBLN6	42.6N	079.5W								

FREQUENCY OF WIND SPEEDS (4-10 KTS)

BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	6.3	2.9	2.0	2.1	4.0	1.7	1.3	2.8
41002	32.3N	075.3W	0.8	3.0	7.1	9.1	9.0	6.9	0.8	1.2
41006	29.3N	077.7W	0.8	3.6	14.4	11.4	15.7	1.9	1.6	1.1
42001	25.9N	089.7W	0.4	3.1	0.2	0.2	0.2	1.6	5.6	9.0
42002	26.0N	093.5W		0.2	0.5	0.9	0.3		0.3	0.3
42003	26.0N	085.9W	0.4	0.8	0.4	1.2	0.3	0.8	0.8	1.0
42007	30.1N	088.9W	0.1	0.1	0.1	0.4	0.7	0.5	0.5	0.6
42008	28.7N	095.3W	0.3	0.3	0.6	1.3	0.5	<.05	0.1	0.4
42009	29.3N	087.5W	1.2	0.4	0.9	1.5	0.2	0.7	0.7	0.8
42011	29.6N	093.5W	0.4	1.1	1.1	0.6	1.2	0.8	0.1	0.3
44003	40.8N	068.5W	1.1	1.2	1.0	0.6	1.4	1.7	1.0	0.6
44004	38.5N	070.7W	1.1	0.6	0.3	0.4	0.9	0.9	0.8	0.8
44005	42.7N	068.3W	0.3	0.3	0.2	0.9	0.3	1.0	0.5	0.3
44007	43.5N	070.1W	0.4	0.3	0.3	0.6	1.4	0.9	0.7	0.5
45001	48.0N	087.6W	0.5	0.3	1.5	0.9	0.8	1.1	0.5	0.3
45003	45.1N	082.8W	0.6	<.05	0.6	1.7	1.7	1.0	0.9	0.4
45004	47.2N	086.5W	0.9	1.2	1.0	0.8	1.4	0.8	0.4	0.6
45005	41.7N	082.5W	0.2	1.0	2.9	1.7	1.2	0.9	0.9	0.7
45006	47.3N	090.0W	1.6	2.0	3.4	1.9	1.6	0.9	1.3	1.4
45007	42.7N	087.1W	1.2	0.9	1.7	1.4	0.7	1.3	0.1	1.2
45008	44.3N	082.4W	0.7	0.8	1.8	2.3	1.5	1.8	1.1	0.8
46011	34.9N	120.9W	0.2	0.1		0.3	0.2	0.8	0.1	0.1
46012	37.4N	122.7W	0.1	0.2	0.3	0.4	0.4		1.6	1.8
46013	38.2N	123.3W	0.2	0.1	0.4	0.7	0.7	0.8	1.2	1.4
46014	39.2N	124.0W	0.5		<.05	0.5	0.5		1.1	1.1
46022	40.7N	124.5W		0.9	0.4					
46025	33.8N	119.0W				0.8				
46026	37.8N	122.7W				1.2				
46027	41.8N	124.4W	7.8							
46028	35.7N	121.9W	3.1							
46042	36.8N	122.4W								
46047	32.4N	119.5W								
46053	34.2N	120.5W								
46054	34.3N	120.4W								
46059	38.0N	129.9W				0.3		5.8	0.2	
46060	60.6N	146.8W								
CSBF1	29.7N	085.4W								
DBLN6	42.6N	079.5W								

FREQUENCY OF WIND SPEEDS (11-21 KTS)

BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	2.1	4.0	2.1	2.8	9.2	5.8	3.3	5.6
41002	32.3N	075.3W	0.8	3.0	6.7	9.0	6.9	0.8	1.2	1.0
41006	29.3N	077.7W	0.8	3.6	14.4	11.4	15.7	1.9	1.6	1.1
42001	25.9N	089.7W	0.4	3.1	0.2	0.2	0.2	1.6	5.6	9.0
42002	26.0N	093.5W		0.2	0.5	0.9	0.3		0.3	0.3
42003	26.0N	085.9W	0.4	0.8	0.4	1.2	0.3	0.8	0.8	1.0
42007	30.1N	088.9W	0.1	0.1	0.1	0.4	0.7	0.5	0.5	0.6
42008	28.7N	095.3W	0.3	0.3	0.6	1.3	0.5	<.05	0.1	0.4
42009	29.3N	087.5W	1.2	0.4	0.9	1.5	0.2	0.7	0.7	0.8
42011	29.6N	093.5W	0.4	1.1	1.1	0.6	1.2	0.8	0.1	0.3
44003	40.8N	068.5W	1.1	1.2	1.0	0.6	1.4	1.7	1.0	0.6
44004	38.5N	070.7W	1.1	0.6	0.3	0.4	0.9	0.9	0.8	0.8
44005	42.7N	068.3W	0.3	0.3	0.2	0.9	0.3	1.0	0.5	0.3
44007	43.5N	070.1W	0.4	0.3	0.3	0.6	1.4	0.9	0.7	0.5
45001	48.0N	087.6W	0.5	0.3	1.5	0.9	0.8	1.1	0.5	0.3
45003	45.1N	082.8W	0.6	<.05	0.6	1.7	1.7	1.0	0.9	0.4
45004	47.2N	086.5W	0.9	1.2	1.0	0.8	1.4	0.8	0.4	0.6
45005	41.7N	082.5W	0.2	1.0	2.9	1.7	1.2	0.9	0.9	0.7
45006	47.3N	090.0W	1.6	2.0	3.4	1.9	1.6	0.9	1.3	1.4
45007	42.7N	087.1W	1.2	0.9	1.7	1.4	0.7	1.3	0.1	1.2
45008	44.3N	082.4W	0.7	0.8	1.8	2.3	1.5	1.8	1.1	0.8
46011	34.9N	120.9W	0.2	0.1		0.3	0.2	0.8	0.1	0.1
46012	37.4N	122.7W	0.1	0.2	0.3	0.4	0.4		1.6	1.8
46013	38.2N	123.3W	0.2	0.1	0.4	0.7	0.7	0.8	1.2	1.4
46014	39.2N	124.0W	0.5		<.05	0.5	0.5		1.1	1.1
46022	40.7N	124.5W		0.9	0.4					
46025	33.8N	119.0W				0.8				
46026	37.8N	122.7W				1.2				
46027	41.8N	124.4W	7.8							
46028	35.7N	121.9W	3.1							
46042	36.8N	122.4W								
46047	32.4N	119.5W								
46053	34.2N	120.5W								
46054	34.3N	120.4W								
46059	38.0N	129.9W				0.3		5.8	0.2	
46060	60.6N	146.8W								
CSBF1	29.7N	085.4W								
DBLN6	42.6N	079.5W								

MAY 1983

FREQUENCY OF WIND SPEEDS (22- 33 KTS)

BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.2	<.05		0.1	0.2	1.5	0.3	0.3
41002	32.3N	075.3W		0.1						
41006	29.3N	077.7W								
42001	25.9N	089.7W	0.9	0.5	0.3	0.9	0.5			
42002	26.0N	093.5W		0.4		0.1				
42003	26.0N	085.9W	0.4			0.4				
42007	30.1N	088.9W	0.1	<.05			0.2	0.4		
42008	28.7N	095.3W	0.2	0.5	2.0	0.8	0.2			
42009	29.3N	087.5W				0.2	0.1			
42011	29.6N	093.5W	0.1	0.7	0.7	2.2				
44003	40.8N	068.5W	0.9					0.1	0.1	
44004	38.5N	070.7W	0.1			0.2	0.2		0.2	
44005	42.7N	068.3W	0.8	0.1	0.2			0.1		0.3
44007	43.5N	070.1W				0.1	0.2			
45001	48.0N	087.6W							0.4	
45003	45.1N	082.8W	0.8	0.5	0.7			1.2	0.4	
45004	47.2N	086.5W								
45005	41.7N	082.5W	0.4							
45006	47.3N	090.0W								
45007	42.7N	087.1W	1.0		0.1	<.05				
45008	44.3N	082.4W	0.8	0.2						
46011	34.9N	148.3W			0.1	1.1				
46022	40.7N	124.5W								
46025	33.8N	119.0W	0.9	0.6		0.2	0.1	0.7	1.8	
46026	37.8N	122.7W		<.05	1.4	2.3	0.8	1.5	3.5	4.7
46027	41.8N	124.4W				2.6	3.5	0.5	0.6	
46028	35.7N	121.9W		0.4						
46042	36.8N	122.4W								
46047	32.4N	119.5W								
46053	34.2N	120.5W								
46054	34.3N	120.4W								
46059	38.0N	129.9W								
46060	60.6N	146.8W								
CSBF1	29.7N	085.4W								
DBLN6	42.6N	079.5W								

FREQUENCY OF WIND SPEEDS (34-47 KTS)

BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W								
41002	32.3N	075.3W								
41006	29.3N	077.7W								
42001	25.9N	089.7W					<.05	0.1		
42002	26.0N	093.5W								
42003	26.0N	085.9W								
42007	30.1N	088.9W								
42008	28.7N	095.3W					<.05	0.1		
42009	29.3N	087.5W								
42011	29.6N	093.5W	0.1							
44003	40.8N	068.5W								
44004	38.5N	070.7W								
44005	42.7N	068.3W								
44007	43.5N	070.1W								
45001	48.0N	087.6W								
45003	45.1N	082.8W								
45004	47.2N	086.5W								
45005	41.7N	082.5W								
45006	47.3N	090.0W								
45007	42.7N	087.1W								
45008	44.3N	082.4W								
46011	34.9N	148.3W								
46022	40.7N	124.5W								
46025	33.8N	119.0W								
46026	37.8N	122.7W								
46027	41.8N	124.4W								
46028	35.7N	121.9W								
46042	36.8N	122.4W								
46047	32.4N	119.5W								
46053	34.2N	120.5W								
46054	34.3N	120.4W								
46059	38.0N	129.9W								
46060	60.6N	146.8W								
CSBF1	29.7N	085.4W								
DBLN6	42.6N	079.5W								

FREQUENCY OF WIND SPEEDS (>47 KTS)

BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W								
41002	32.3N	075.3W								
41006	29.3N	077.7W								
42001	25.9N	089.7W								
42002	26.0N	093.5W								
42003	26.0N	085.9W								
42007	30.1N	088.9W								
42008	28.7N	095.3W								
42009	29.3N	087.5W								
42011	29.6N	093.5W								
44003	40.8N	068.5W								
44004	38.5N	070.7W								
44005	42.7N	068.3W								
44007	43.5N	070.1W								
45001	48.0N	087.6W								
45003	45.1N	082.8W								
45004	47.2N	086.5W								
45005	41.7N	082.5W								
45006	47.3N	090.0W								
45007	42.7N	087.1W								
45008	44.3N	082.4W								
46011	34.9N	148.3W								
46022	40.7N	124.5W								
46025	33.8N	119.0W								
46026	37.8N	122.7W								
46027	41.8N	124.4W								
46028	35.7N	121.9W								
46042	36.8N	122.4W								
46047	32.4N	119.5W								
46053	34.2N	120.5W								
46054	34.3N	120.4W								
46059	38.0N	129.9W								
46060	60.6N	146.8W								
CSBF1	29.7N	085.4W								
DBLN6	42.6N	079.5W								

JUNE 1983 — AIR TEMPERATURE (DEG C)

BUOY	LAT	LONG	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	34.9N	072.9W	718	30	26.2	21 19	19.1	05 07	22.7
41002	32.3N	075.3W	719	30	25.8	29 21	20.7	03 08	23.8
41006	29.3N	077.3W	719	30	28.5	30 20	21.5	05 21	25.4
42001	25.9N	089.7W	712	30	30.3	12 19	23.7	07 14	28.2
42002	26.0N	093.5W	718	30	30.6	24 21	24.8	18 22	27.6
42003	26.0N	085.9W	687	30	30.5	30 16	22.0	12 21	26.8
42007	30.1N	088.9W	716	30	28.1	18 04	19.6	01 13	25.9
42008	28.7N	095.3W	710	30	28.6	29 21	20.1	01 15	25.8
42009	29.3N	087.5W	714	30	29.5	30 23	21.7	19 17	25.5
42011	29.6N	093.5W	075	04	29.1	30 22	27.1	27 21	28.0
44003	40.8N	068.5W	718	30	16.5	18 23	09.5	06 07	12.4
44004	38.5N	070.7W	717	30	24.8	27 23	14.3	02 04	20.5
44005	42.7N	068.3W	718	30	18.4	21 19	08.9	06 04	13.2
44007	43.5N	070.1W	715	30	25.9	23 18	10.3	01 10	15.3
45001	48.0N	087.6W	530	23	10.9	12 08	03.3	03 11	05.7
45002	45.3N	086.3W	710	30	20.7	23 23	05.7	01 07	12.2
45003	45.3N	082.8W	698	30	20.2	20 23	04.8	01 07	10.9
45004	47.2N	086.5W	626	28	10.9	26 11	03.1	18 06	06.6
45005	41.7N	082.5W	719	30	28.3	23 20	11.8	08 16	19.4
45006	47.3N	090.0W	667	30	11.9	22 22	03.3	09 06	06.4
45007	42.7N	087.1W	716	30	23.9	27 02	07.1	01 10	14.8
45008	44.3N	082.4W	372	17	22.5	26 22	06.8	01 00	15.9
45009	41.6N	082.0W	331	15	27.2	26 21	16.0	29 09	21.1
46001	56.3N	148.3W	718	30	12.2	22 23	07.0	01 07	09.6
46002	42.5N	130.3W	709	30	14.8	28 22	10.8	01 14	13.0
46003	51.9N	155.7W							
46004	50.9N	135.9W	719	30	12.8	25 22	07.6	03 08	10.3
46005	46.1N	131.0W	708	30	14.8	27 00	09.6	01 06	11.9
46006	40.7N	137.7W	714	30	15.8	11 22	12.1	01 11	14.1
46010	46.2N	124.2W	384	17	15.6	27 23	11.9	23 16	14.1
46011	34.9N	120.9W	708	30	15.1	11 06	10.1	06 11	13.4
46012	37.4N	122.7W	712	30	16.6	07 01	10.9	14 08	12.8
46013	38.2N	123.3W	690	30	15.3	07 02	10.3	03 12	12.1
46014	39.2N	124.0W	488	22	15.3	17 22	10.8	14 14	13.3
46016	63.3N	170.3W	221	30	11.8	25 00	00.1	01 18	04.1
46017	60.3N	172.3W	232	30	10.6	29 03	00.4	12 15	05.5
46019	57.2N	170.3W	238	30	09.7	29 00	00.1	03 15	05.6
46020	55.9N	168.0W	023	03	06.6	02 03	03.0	03 18	05.0
46022	40.8N	124.5W	715	30	15.4	22 21	10.1	07 18	13.0
46023	34.3N	120.7W	708	30	15.8	28 21	12.3	06 12	14.1
46024	32.8N	119.2W	710	30	18.6	21 00	13.1	02 13	15.0
46025	33.6N	119.0W	706	30	19.4	19 20	14.2	06 12	16.5
46026	37.8N	122.7W	712	30	18.0	06 23	10.2	14 08	12.3
51001	23.4N	162.3W	715	30	25.2	18 03	22.1	17 14	24.2
CSBF1	29.7N	085.4W	717	30	29.2	27 18	19.3	08 10	25.3
DBLN6	42.6N	079.5W	711	30	28.2	30 21	08.2	09 09	18.5

SEA TEMPERATURE (DEG C)

BUOY	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	718	30	26.6	24 22	21.6	02 18	23.4
41002	719	30	26.0	20 19	21.9	02 12	24.3
41006	719	30	29.8	30 20	24.9	16 09	26.3
42001	719	30	30.9	21 22	26.7	02 11	28.5
42002	708	30	30.8	25 01	25.9	01 11	28.2
42003	687	30	30.0	30 17	26.5	21 06	28.0
42007	710	30	28.8	15 22	23.9	10 12	26.7
42008	717	30	29.5	24 01	24.4	01 11	27.2
42009	715	30	30.3	30 21	25.4	01 10	26.6
42011							
44003	718	30	11.8	22 19	09.1	01 06	10.1
44004	717	30	26.7	26 18	18.5	05 01	23.1
44005	719	30	17.9	21 20	07.3	01 10	11.9
44007	713	30	18.2	21 18	08.6	01 09	13.4
45001	536	23	03.6	19 20	02.7	01 11	03.1
45002	712	30	17.5	25 22	04.4	01 03	10.3
45003	716	30	15.4	21 23	03.7	03 09	08.7
45004	645	28	03.7	24 18	02.8	01 00	03.2
45005	662	30	24.5	26 23	12.3	01 11	18.9
45006	713	30	04.0	26 22	02.4	02 11	03.3
45007	709	30	20.8	25 20	06.9	01 05	13.0
45008	385	18	17.8	23 00	04.9	01 00	14.5
45009	339	15	25.1	26 22	17.6	29 06	21.2
46001	718	30	13.0	23 00	08.1	01 00	10.0
46002	709	30	15.2	27 22	12.9	02 11	13.9
46003	716	30	09.7	14 03	06.9	01 15	08.1
46004	719	30	12.7	27 00	08.7	01 14	10.3
46005	712	30	16.1	27 01	11.8	02 11	12.9
46006	715	30	15.3	12 00	12.3	01 16	13.5
46010	382	17	17.4	21 21	13.4	28 17	15.3
46011	708	30	16.0	23 19	12.1	01 15	14.2
46012	712	30	16.0	07 02	11.3	04 17	12.9
46013	709	30	12.8	06 20	09.2	21 12	10.5
46014	488	22	15.2	17 21	10.3	01 00	12.7
46016							
46017							
46019							
46020	023	03	06.2	03 00	05.1	01 12	05.6
46022	715	30	15.1	22 21	10.6	03 16	12.4
46023	706	30	17.0	22 21	12.4	04 09	14.8
46024	710	30	18.2	21 01	14.7	01 17	16.0
46025	704	30	20.3	30 15	16.4	02 09	18.1
46026	703	30	16.3	06 23	10.1	01 14	12.7
51001	716	30	25.4	06 01	24.5	01 11	25.0
CSBF1							
DBLN6							

AIR-SEA TEMPERATURE DIFFERENCE (DEG C)

BUOY	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	718	30	01.5	08 13	-03.9	22 08	-00.6
41002	719	30	01.7	04 13	-04.4	10 01	-00.5
41006	719	30	00.7	07 13	-04.5	05 21	-00.9
42001	719	30	01.6	03 03	-04.6	27 21	-00.3
42002	719	30	01.4	06 20	-03.6	18 22	-00.6
42003	688	30	01.0	30 16	-06.0	12 21	-01.2
42007	718	30	01.5	23 14	-07.0	01 13	-00.8
42008	717	30	00.4	06 14	-05.5	17 18	-01.4
42009	715	30	00.5	30 14	-04.4	19 17	-01.1
42011							
44003	718	30	06.6	18 23	00.1	06 06	02.3
44004	718	30	01.4	04 23	-07.0	11 09	-02.6
44005	719	30	04.1	13 07	-01.1	17 00	01.3
44007	719	30	12.6	13 04	-02.8	15 23	01.9
45001	626	28	07.8	12 08	00.4	03 11	02.6
45002	719	30	06.2	14 08	-01.1	27 14	01.9
45003	716	30	07.1	20 23	-01.4	18 16	02.2
45004	716	30	07.6	13 23	-00.1	18 06	03.4
45005	719	30	05.9	12 19	-03.8	28 16	00.4
45006	713	30	08.4	22 22	00.3	09 06	03.3
45007	719	30	06.1	22 01	-01.7	28 06	01.7
45008	717	30	07.1	26 22	-06.7	14 23	01.6
45009	341	15	04.6	30 16	-03.6	28 16	00.1
46001	718	30	00.9	10 21	-02.1	15 14	-00.3
46002	709	30	00.4	10 01	-02.7	25 11	-00.8
46003							
46004	719	30	01.0	10 21	-02.1	29 06	00.0
46005	712	30	00.4	16 21	-02.9	19 15	-01.0
46006	715	30	02.2	13 19	-01.7	04 06	00.7
46010	388	17	01.1	28 07	-03.6	18 23	-01.3
46011	708	30	01.3	16 23	-03.6	14 13	-00.8
46012	712	30	02.2	06 21	-02.5	14 00	-00.1
46013	710	30	03.5	07 02	-00.7	03 19	01.6
46014	708	30	02.4	27 20	-01.3	14 14	01.0
46016							
46017							
46019							
46020	023	03	00.8	02 03	-02.8	03 18	-00.6
46022	715	30	02.5	28 19	-01.3	11 15	00.6
46023	711	30	01.1	11 06	-02.7	26 13	-00.7
46024	710	30	00.9	21 00	-03.0	14 07	-01.0
46025	707	30	00.8	12 20	-03.4	25 13	-01.6
46026	712	30	02.0	26 05	-03.4	14 08	-00.4
51001	716	30	00.2	18 03	-02.9	21 18	-00.8
CSBF1							
DBLN6							

JUNE 1983 — PRESSURE (MB)

BUOY	LAT	LONG	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	34.9N	072.9W	718	30	1024.1	11 16	1005.8	01 06	1017.3
41002	32.3N	075.3W	719	30	1023.9	27 15	1007.4	01 00	1016.9
41006	29.3N	077.3W	719	30	1022.5	27 15	1008.9	01 00	1015.7
42001	25.9N	089.7W	719	30	1017.6	30 16	1007.6	07 09	1013.5
42002	26.0N	093.5W	719	30	1018.2	10 17	1007.8	01 00	1013.4
42003	26.0N	085.9W	687	30	1018.4	27 04	1008.7	01 00	1014.1
42007	30.1N	088.9W	715	30	1019.9	10 17	1007.2	01 00	1014.5
42008	28.7N	095.3W	716	30	1018.1	10 17	1007.1	06 09	1012.7
42009	29.3N	087.5W	715	30	1019.1	10 17	1008.0	01 00	1014.3
42011	29.6N	093.5W	492	22	1018.7	10 17	1007.4	06 10	1013.2
44003	40.8N	068.5W	718	30	1026.2	09 23	1004.1	25 14	1015.6
44004	38.5N	070.7W	717	30	1025.2	11 16	1005.8	08 14	1016.1
44005	42.7N	068.3W	719	30	1027.7	10 02	1003.1	04 21	1015.1
44007	43.5N	070.1W	719	30	1027.2	10 05	1001.9	04 20	1015.2
45001	48.0N	087.6W	536	23	1023.1	10 17	1001.1	06 20	1014.0
45002	45.3N	086.3W	718	30	1023.3	10 16	1003.9	07 02	1015.4
45003	45.3N	082.8W	716	30	1024.2	21 17	1003.1	01 00	1015.9
45004	47.2N	086.5W	716	30	1024.3	10 17	1003.1	06 22	1015.6
45005	41.7N	082.5W	719	30	1023.7	11 15	1003.4	04 08	1015.7
45006	47.3N	090.0W	712	30	1020.2	27 17	1002.0	30 21	1014.4
45007	42.7N	087.1W	719	30	1023.0	22 15	1005.9	04 00	1015.6
45008	44.3N	082.4W	717	30	1023.7	21 15	1003.1	01 00	1015.9
45009	41.6N	082.0W	341	15	1023.2	22 14	1009.8	28 15	1016.4
46001	56.3N	148.3W	718	30	1025.9	05 23	996.0	16 06	1008.7
46002	42.5N	130.3W	709	30	1029.4	05 08	1006.7	30 15	1019.3
46003	51.9N	155.7W	716	30	1020.2	06 22	986.7	20 16	1005.9
46004	50.9N	135.9W	719	30	1025.6	03 21	994.4	30 23	1013.5
46005	46.1N	131.0W	712	30	1028.9	05 21	999.9	30 16	1017.0
46006	40.7N	137.7W	715	30	1032.4	03 22	1010.7	13 19	1022.8
46010	46.2N	124.2W	387	17	1023.4	15 21	1007.9	17 13	1016.8
46011	34.9N	120.9W	708	30	1018.9	28 07	1007.0	01 01	1013.3
46012	37.4N	122.7W	711	30	1029.2	28 06	1007.1	01 13	1015.1
46013	38.2N	123.3W	710	30	1028.3	28 18	1007.3	01 11	1015.1
46014	39.2N	124.0W	659	29	1019.4	18 17	1007.8	07 12	1014.4
46016	63.3N	170.3W	238	30	1028.9	07 00	999.1	16 06	1013.2
46017	60.3N	172.3W	240	30	1027.9	06 12	1001.2	26 03	1012.5
46019	57.2N	170.3W	240	30	1026.7	06 09	999.4	26 06	1011.2
46020	55.9N	168.0W	023	03	1023.2	02 21	1000.7	01 00	1016.3
46022	40.8N	124.5W	715	30	1022.7	19 06	1008.0	07 13	1017.0
46023	34.3N	120.7W	710	30	1018.0	28 07	1006.9	01 02	1012.8
46024	32.8N	119.2W	710	30	1019.2	28 06	1006.0	01 00	1013.9
46025	33.6N	119.0W	707	30	1017.8	28 06	1006.6	01 01	1012.9
46026	37.8N	122.7W	712	30	1020.2	28 17	1006.7	01 10	1014.7
51001	23.4N	162.3W	716	30	1022.6	29 19	1015.2	03 14	1019.3
CSBF1	29.7N	085.4W	718	30	1020.3	10 15	1009.0	01 00	1015.3
DBLN6	42.6N	079.5W	711	30	1024.0	22 14	1002.3	04 09	1015.7

WIND SPEEDS (KNOTS) / MEAN WIND SPEED (KNOTS)

BUOY	OBS	MAX	DY HR	DIR	N	NE	E	SE	S	SW	W	NW	TOTAL
41001	710	33	08 11	210	12.8	13.0	11.3	8.5	16.4	15.3	9.3	9.1	12.8
41002	702	20	06 16	220	6.4	11.3	10.0	7.9	11.1	10.5	7.1	4.2	10.2
41006	695	21	08 09	250	7.8	9.1	6.5	6.8	8.3	8.1	7.4	6.8	07.7
42001	708	30	26 22	170	10.0	9.7	9.9	11.7	12.2	10.6	10.5	10.5	11.0
42002	701	27	07 08	010	9.7	8.1	9.6	9.9	10.3	5.3	1.9	1.0	09.5
42003	684	23	20 13	120	9.8	9.3	8.6	8.8	9.3	8.4	9.0	6.5	08.9
42007	701	26	04 17	290	8.0	10.0	11.3	10.1	10.2	9.2	6.3	7.1	09.9
42008	709	27	07 00	360	12.4	9.4	9.7	11.4	10.3	7.0	6.6	8.7	10.6
42009	694	18	05 01	360	5.8	8.0	9.9	8.4	8.4	8.0	6.6	4.2	08.2
42011	487	24	06 15	010	11.7	10.4	9.5	11.4	10.8	9.5	5.5	5.6	10.5
44003	693	22	04 21	200	6.7	8.1	7.6	4.6	8.6	7.9	7.2	6.3	07.5
44004	695	25	28 06	240	10.0	11.4	7.3	5.8	11.4	13.1	9.2	7.8	10.4
44005	701	21	04 19	170	5.4	5.5	5.4	7.1	8.8	6.9	6.9	6.1	06.8
44007	690	20	07 02	190	7.3	6.8	7.3	6.2	8.2	9.0	7.2	7.2	07.9
45001	484	17	06 20	250	6.9	7.5	6.7	7.8	7.3	8.0	7.5	6.6	07.4
45002													
45003	690	18	26 08	200	4.6	6.7	4.9	6.3	7.2	6.5	8.0	7.7	06.9
45004	707	15	25 20	170	6.8	6.6	6.7	7.9	8.1	7.6	5.9	6.5	07.1
45005	705	20	28 17	060	5.9	8.2	7.4	5.3	5.3	6.5	6.1	5.1	06.4
45006	700	16	12 21	190	5.0	6.7	6.0	7.0	6.8	7.7	6.0	4.7	06.6
45007	697	18	28 03	080	6.3	7.4	8.3	6.9	7.4	6.4	4.7	4.6	06.9
45008	684	18	09 18	150	6.2	8.3	4.1	7.1	7.2	7.4	5.6	6.2	06.8
45009	323	24	28 17	050	8.8	10.6	5.5	3.7	7.4	7.1	4.1	3.6	07.2
46001	712	21	21 03	120	7.0	7.9	10.4	12.2	8.3	7.7	7.7	4.3	09.5
46002	697	23	30 13	210	12.9	10.3		4.7	11.8	12.4	13.0	13.1	12.8
46003	715	32	20 07	110	13.8	18.9	15.3	15.1	12.6	13.9	14.2	15.1	15.0
46004	719	25	15 22	170	8.5	9.5	10.1	11.8	11.8	10.6	11.6	12.7	11.4
46005	711	25	17 00	190	1.0	4.8	6.6	11.8	14.1	11.5	14.1	14.0	13.1
46006	712	29	13 18	180	10.5	11.0		13.4	14.2	15.7	15.9	13.2	14.6
46010	371	23	14 22	190	7.5	6.5	5.1	5.0	13.3	12.0	9.8	8.5	09.4
46011	691	25	11 14	330	10.2	3.7	1.0	3.8	3.9	3.8	6.3	14.9	13.3
46012	304	23	01 02	310	5.0			5.8	5.8	2.4	6.6	11.0	08.7
46013	697	31	20 05	310	3.4	1.4	2.5	1.9	4.8	2.9	15.2	18.2	17.0
46014	487	30	20 02	320	11.6	5.3					8.0	17.6	16.9
46016	236	27	22 18	050	5.4	14.5	8.2	12.8	8.0	9.1	9.1	7.2	11.0
46017	239	17	26 00	020	7.3	9.5	8.6	8.6	6.2	8.0	7.3	1.2	08.7
46019	237	18	07 06	110	7.2	7.8	8.3	9.6	6.9	4.5	8.0	5.5	07.9
46020	023	11	03 12	010	8.0	5.8	7.7	6.0				7.2	07.5
46022	707	26	01 05	340	13.6	7.7	6.0	3.2	5.4	5.0	4.0	10.6	11.9
46023	706	26	15 09	330	16.4	5.3	9.0	6.5	2.5	2.8	4.5	16.5	15.6
46024	677	28	01 07	320	4.8	2.1	1.9	1.7	2.3	3.1	6.5	13.0	11.4
46025	670	20	02 02	290	3.4	2.3	3.2	4.2	3.4	3.6	6.6	6.8	05.4
46026	703	24	01 01	310	4.3	1.0	1.0	3.0	5.9	4.9	10.2	14.1	11.9
51001	715	22	17 14	090		13.2	12.8	11.6					13.0
CSBF1	718	20	05 04	170	2.9	3.4	6.4	5.5	7.2	6.7	6.7	2.8	05.7
DBLN6	714	24	07 15	230	5.7	9.0	3.2	4.2	4.7	8.2	4.2	5.4	06.3

JUNE 1983 — WAVE HEIGHTS (METERS) / FREQUENCY OF WAVE HEIGHTS (%)

BUOY	LAT	LONG	OBS	MAX	DY HR	MEAN	<1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	718	3.0	08 14	1.3	13.5	66.1	19.7	0.5				
41002	32.3N	075.3W	695	2.5	01 00	1.3	15.3	56.9	27.6					
41006	29.3N	077.3W	718	2.5	17 00	1.1	18.5	68.2	13.2					
42001	25.9N	089.7W	718	2.0	06 19	0.8	44.8	54.3	0.8					
42002	26.0N	093.5W	719	2.5	07 11	0.8	42.1	56.6	1.2					
42003	26.0N	085.9W	657	2.0	20 17	0.7	56.9	42.4	0.6					
42007	30.1N	088.9W	659	1.5	11 18	0.6	73.8	26.1						
42009	29.3N	087.5W	691	2.0	07 11	0.8	36.0	62.0	1.8					
44003	40.8N	068.5W	718	2.5	05 06	1.0	26.7	65.3	7.9					
44004	38.5N	070.7W	717	3.0	08 01	1.1	27.7	54.1	17.8	0.2				
44005	42.7N	068.3W	719	3.0	04 21	0.8	40.7	57.4	1.3	0.4				
44007	43.5N	070.1W	626	2.0	07 00	0.6	70.7	28.9	0.3					
45001	48.0N	087.6W	398	2.0	06 19	0.6	66.5	32.9	0.5					
45002	45.3N	086.3W	446	1.5	06 23	0.6	69.5	30.4						
45003	45.3N	082.8W	326	2.0	09 19	0.6	75.4	23.9	0.6					
45005	41.7N	082.5W	417	2.5	28 16	0.7	70.7	23.9	5.2					
45006	47.3N	090.0W	408	1.0	04 20	0.5	80.8	19.1						
45007	42.7N	087.1W	360	2.0	28 04	0.6	74.4	24.7	0.8					
45008	44.3N	082.4W	368	2.0	27 19	0.6	70.3	29.0	0.5					
45009	41.6N	082.0W	170	2.5	28 18	0.7	74.7	20.0	5.2					
46001	56.3N	148.3W	718	3.5	21 04	1.7	4.3	52.6	32.7	10.7				
46002	42.5N	130.3W	707	4.0	18 07	2.0		42.2	42.0	15.2	0.4			
46003	51.9N	155.7W	714	4.0	05 13	2.1		33.7	49.0	14.1	3.0			
46004	50.9N	135.9W	716	3.5	16 20	1.9		34.3	57.4	8.2				
46005	46.1N	131.0W	711	3.5	01 19	2.0		42.8	39.0	18.0				
46006	40.7N	137.7W	712	5.0	17 20	1.9	1.8	38.4	46.0	10.5	3.0			
46010	46.2N	124.2W	387	3.0	18 03	1.7	0.2	54.2	43.9	1.5				
46011	34.9N	120.9W	708	4.5	01 01	2.1		28.3	58.0	13.8	1.6			
46012	37.4N	122.7W	708	4.5	01 01	2.1		38.5	43.9	11.8	5.6			
46013	38.2N	123.3W	708	4.5	01 01	2.4		21.8	47.1	21.8	9.0			
46014	39.2N	124.0W	658	4.0	01 00	2.2	2.4	25.9	44.0	26.1	1.3			
46022	40.8N	124.5W	714	4.0	01 06	2.0	4.0	40.8	29.4	22.8	2.8			
46023	34.3N	120.7W	709	4.5	01 04	2.3		18.0	54.8	22.1	4.9			
46024	32.8N	119.2W	702	4.0	01 07	1.8	0.9	49.8	41.3	7.6	0.1			
46025	33.6N	119.0W	701	2.5	01 05	1.1	10.4	76.0	13.5					
46026	37.8N	122.7W	711	3.5	01 02	1.6	0.2	61.0	32.0	6.6				
51001	23.4N	162.3W	714	3.0	19 10	1.8		38.3	61.4	0.1				

JUNE 1983			TOTAL FREQUENCY OF WIND SPEEDS (%)							TOTAL FREQUENCY OF WIND DIRECTIONS (%)							
BUOY	LAT	LONG	CALM	<4KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		6.5	29.3	56.6	7.6			5.0	13.8	33.7	5.2	16.0	17.2	6.1	3.1
41002	32.3N	075.3W		6.0	41.6	52.4				3.1	36.6	14.1	3.9	12.8	22.7	4.3	2.4
41006	29.3N	077.3W		15.4	59.7	24.9				12.7	17.6	20.2	12.9	24.6	7.4	2.8	1.8
42001	25.9N	089.7W		2.3	48.3	48.0	1.4			7.6	8.8	24.5	36.0	19.8	1.0	1.2	1.1
42002	26.0N	093.5W		3.9	60.1	35.7	0.4			5.6	12.5	30.8	38.4	10.7	1.2	0.5	0.1
42003	26.0N	085.9W	0.3	3.8	69.7	26.3	0.1			6.0	20.3	28.2	31.6	9.9	2.6	0.8	0.6
42007	30.1N	088.9W		6.8	46.8	46.2	0.1			3.9	11.9	14.7	19.1	25.6	19.8	3.8	1.2
42008	28.7N	095.3W	0.1	5.8	44.9	48.7	0.7			9.0	5.9	17.0	38.1	24.5	3.3	1.2	1.0
42009	29.3N	087.5W		10.7	62.5	26.8				6.7	11.0	19.6	17.1	23.0	14.6	4.8	3.2
42011	29.6N	093.5W	0.4	5.5	44.1	50.1	0.2			10.4	8.1	8.0	24.9	28.0	17.4	2.3	1.0
44003	40.8N	068.5W		15.3	63.3	21.2	0.1			10.1	14.0	5.4	3.2	13.0	26.9	18.4	9.0
44004	38.5N	070.7W		10.4	42.6	45.2	1.9			11.0	17.1	10.0	1.2	8.0	22.9	17.8	12.1
44005	42.7N	068.3W		17.0	71.3	11.7				9.0	7.2	5.8	4.1	17.6	22.4	20.5	13.4
44007	43.5N	070.1W		12.2	65.1	22.8				11.1	4.1	6.2	5.7	19.1	28.6	14.7	10.5
45001	48.0N	087.6W		7.4	80.4	12.2				5.1	4.9	13.2	28.5	20.4	8.6	13.0	6.5
45003	45.3N	082.8W		15.1	69.3	15.7				3.8	5.4	5.8	20.1	26.1	8.2	15.1	15.7
45004	47.2N	086.5W		9.8	80.8	9.5				7.7	8.7	11.5	17.8	19.7	10.6	12.8	11.2
45005	41.7N	082.5W		18.3	69.6	12.1				5.3	19.1	17.6	18.5	18.2	11.8	6.5	2.9
45006	47.3N	090.0W		12.3	79.9	7.9				5.0	25.5	16.9	14.1	9.9	16.6	9.0	3.0
45007	42.7N	087.1W		13.2	73.3	13.5				10.2	12.2	13.9	16.7	25.4	11.2	4.2	6.2
45008	44.3N	082.4W		15.2	70.0	14.8				14.2	12.9	6.6	20.9	22.0	9.3	5.8	8.2
45009	41.6N	082.0W		21.1	55.7	21.4	1.9			12.7	31.6	16.2	9.8	15.8	3.6	5.1	5.2
46001	56.3N	148.3W		7.2	53.8	39.0				5.2	10.4	23.8	28.3	12.7	8.6	7.7	3.2
46002	42.5N	130.3W		2.7	23.8	72.7	0.7			18.0	1.4		0.3	6.0	14.9	30.1	29.3
46003	51.9N	155.7W		2.9	18.9	67.0	11.2			9.1	16.1	7.2	12.0	12.8	15.6	16.2	10.9
46004	50.9N	135.9W		5.0	38.4	54.2	2.4			2.1	2.1	4.6	12.3	26.7	19.6	18.2	14.6
46005	46.1N	131.0W		4.1	26.9	63.2	5.9			0.2	0.9	1.3	2.0	15.0	26.5	35.4	18.6
46006	40.7N	137.7W		1.4	22.1	65.6	11.0			6.3	<.05		0.2	18.6	20.6	32.5	21.8
46010	46.2N	124.2W		8.4	53.9	37.2	0.5			14.5	1.8	3.9	3.2	11.3	15.0	22.0	28.4
46011	34.9N	120.9W		7.1	22.1	63.1	7.7			12.7	0.6	0.1	1.3	1.9	1.6	3.8	77.9
46012	37.4N	122.7W		21.7	43.4	33.6	1.3			0.2			3.2	9.2	6.2	26.6	54.6
46013	38.2N	123.3W		5.5	11.0	56.8	26.7			0.4	0.2	0.3	0.6	1.4	1.6	19.5	76.0
46014	39.2N	124.0W		0.4	9.9	70.8	18.9			9.7	0.5					0.5	89.4
46016	63.3N	170.3W		7.6	47.9	36.9	7.6			3.8	30.1	8.3	1.2	1.1	6.4	30.9	10.3
46017	60.3N	172.3W		7.5	62.8	29.7				3.1	51.8	12.8	4.5	1.4	16.5	9.3	0.6
46019	57.2N	170.3W		13.1	61.6	25.3				18.1	25.4	32.9	11.7	2.7	2.4	3.4	3.3
46020	55.9N	168.0W			91.3	8.7				51.1	10.9	12.0	4.3				21.7
46022	40.8N	124.5W		5.9	36.4	52.9	4.8			63.9	2.9	1.0	1.3	1.7	2.2	2.1	24.8
46023	34.3N	120.7W		3.8	14.4	66.9	14.9			20.8	1.0	0.1	0.3	0.4	1.2	4.4	71.9
46024	32.8N	119.2W		9.2	39.0	46.5	5.3			1.5	0.7	0.3	0.4	0.8	1.3	17.5	77.5
46025	33.6N	119.0W		32.4	59.9	7.8				1.8	1.8	3.9	8.3	7.9	16.3	46.7	13.4
46026	37.8N	122.7W		7.4	28.0	63.7	0.9			0.5	<.05	0.2	1.5	5.3	6.5	24.6	61.3
51001	23.4N	162.3W		0.1	18.5	81.3	0.1				40.3	59.5	0.2				
CSBF1	29.7N	085.4W	4.8	28.4	62.7	8.9				5.4	17.0	14.2	13.1	23.0	12.8	9.7	4.8
DBLN6	42.6N	079.5W	6.6	28.2	54.5	16.5	0.8			10.3	15.3	5.4	12.2	17.4	29.9	6.9	2.7

JUNE 1983			% FREQUENCY OF WIND SPEEDS (<4 KTS)								% FREQUENCY OF WIND SPEEDS (4-10 KTS)								% FREQUENCY OF WIND SPEEDS (11-21 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.9	0.6	0.8	0.7	1.5	0.6	0.8	0.6	0.4	3.9	13.9	2.7	1.8	2.6	2.6	1.4	3.5	8.8	18.7	1.8	7.5	12.6	2.7	1.0
41002	32.3N	075.3W	1.1	1.3	0.6	0.2	0.1	0.4	1.0	1.4	1.3	10.0	5.9	3.5	6.0	11.6	2.4	0.9	0.7	25.3	7.6	0.2	6.7	10.0	1.0	0.1
41006	29.3N	077.3W	0.9	2.4	4.6	2.2	3.3	1.4	0.1	0.5	9.4	7.4	12.7	9.1	14.2	3.9	2.4	0.7	2.4	7.8	2.9	1.6	7.1	2.1	0.3	0.6
42001	25.9N	089.7W	0.3	0.2	0.4	0.1	0.5	<.05	0.4	0.3	4.7	5.6	15.1	15.0	7.2	0.4	0.1	0.2	2.6	2.9	9.0	20.7	11.0	0.5	0.6	0.6
42002	26.0N	093.5W	0.7	0.5	0.7	0.3	0.6	0.4	0.5	0.1	2.5	10.1	18.0	24.5	4.3	0.7			2.0	2.0	12.2	13.6	5.7	0.2		
42003	26.0N	085.9W	0.1	0.2	0.9	1.6	0.9			0.1	3.9	14.9	21.3	21.5	5.1	1.9	0.7	0.4	2.0	5.3	6.0	8.3	3.9	0.6	0.1	<.05
42007	30.1N	088.9W	0.5	0.2	0.3	1.9	0.9	1.6	0.9	0.5	2.1	6.3	6.0	6.5	12.3	10.8	2.4	0.5	1.3	5.3	8.5	10.8	12.4	7.4	0.3	0.1
42008	28.7N	095.3W	0.1	0.5	1.0	2.0	1.2	0.5	0.3	0.1	3.5	3.3	9.2	13.4	11.7	2.3	0.8	0.7	5.0	1.9	6.8	22.7	11.6	0.5	0.1	0.1
42009	29.3N	087.5W	1.6	1.0	0.8	0.7	2.2	1.7	1.3	1.4	4.4	7.5	9.8	12.4	15.0	8.9	2.8	1.8	0.7	2.5	9.0	4.1	5.8	4.1	0.6	
42011	29.6N	093.5W	0.4		1.0	0.7	1.3	1.1	0.6	0.4	4.1	4.4	3.7	9.2	12.5	8.1	1.6	0.5	5.7	3.7	3.3	15.0	14.1	8.1		0.1
44003	40.8N	068.5W	2.2	2.5	1.2	1.2	1.3	1.7	2.7	2.6	5.7	7.8	2.7	2.0	7.3	19.4	12.7	5.6	2.1	3.8	1.5	0.1	4.3	5.8	3.0	0.8
44004	38.5N	070.7W	1.8	1.1	0.6	0.3	0.8	1.5	2.0	2.2	3.9	5.4	7.8	0.9	2.3	6.9	8.6	6.7	5.1	10.3	1.6		4.9	13.2	7.1	3.0
44005	42.7N	068.3W	3.5	1.6	1.3	0.6	0.9	3.9	2.4	2.9	5.0	5.6	4.6	2.7	12.4	15.7	16.5	8.9	0.5			0.9	4.3	2.8	1.6	1.5
44007	43.5N	070.1W	1.5	1.0	0.9	1.0	2.8	2.0	1.3	1.6	7.8	2.4	3.8	4.1	11.2	16.4	11.8	7.6	1.8	0.7	1.4	0.6	5.1	10.2	1.6	1.3
45001	48.0N	087.6W	0.4	0.6	1.2	1.3	1.9	0.5	0.7	0.8	4.3	3.0	11.5	23.4	16.5	6.2	10.0	5.5	0.4	1.2	0.5	3.7	2.0	1.9	2.3	0.2
45003	45.3N	082.8W	1.8	1.3	1.2	2.7	3.3	1.4	1.2	2.0	1.7	3.4	4.4	15.5	19.2	5.8	9.3	9.4	0.3	0.6	0.1	1.8	3.6	1.0	4.1	4.2
45004	47.2N	086.5W	0.6	1.6	0.8	0.4	1.2	0.9	2.5	1.8	6.6	6.2	10.2	16.2	16.1	7.5	9.4	8.6	0.5	0.9	0.5	1.2	2.4	2.2	0.9	0.8
45005	41.7N	082.5W	1.6	2.0	2.5	4.6	4.4	1.6	1.0	0.7	3.0	13.0	11.0	13.3	13.0	8.8	5.4	2.2	0.8	4.1	4.0	0.6	0.9	1.4	0.2	<.05
45006	47.3N	090.0W	0.7	2.4	2.1	2.4	1.1	1.3	1.4	1.0	4.3	22.3	13.8	9.6	8.1	12.2	7.6	2.0		0.9	0.9	2.1	0.7	3.1	0.1	
45007	42.7N	087.1W	1.8	1.9	0.8	1.4	1.8	1.6	1.9	1.9	7.2	7.6	10.1	14.2	20.0	8.2	1.9	4.1	1.2	2.7	2.9	1.1	3.6	1.4	0.4	0.1
45008	44.3N	082.4W	1.8	2.6	2.6	2.0	1.7	1.2	1.2	2.1	11.8	5.5	4.0	15.9	17.3	6.3	4.5	4.8	0.6	4.8		3.0	3.1	1.8	0.1	1.3
45009	41.6N	082.0W	3.5	1.0	4.7	4.3	3.9	0.4	0.9	2.3	7.7	17.3	9.4	5.5	6.6	2.0	4.3	2.9	1.5	11.4	2.0		5.3	1.2		
46001	56.3N	148.3W	0.7	1.3	1.0	0.6	1.2	0.9	0.3	1.1	4.6	7.3	11.7	9.2	7.6	5.7	5.7	2.1		1.8	11.1	18.5	3.9	2.0	1.8	
46002	42.5N	130.3W	0.2	0.3		0.2	0.1	<.05	1.1	0.8	3.6	0.1			1.9	4.6	7.0	6.6	14.2	0.9		0.1	4.0	9.7	21.0	22.0
46003	51.9N	155.7W	0.4	<.05	0.2	<.05	1.0	0.6	0.5	0.1	2.1	2.4	1.7	3.4	3.0	2.4	2.7	1.1	6.5	6.7	4.0	6.2	8.7	12.2	12.9	9.7
46004	50.9N	135.9W	0.1	0.5	0.4	1.4	2.0	0.5	0.1		1.2	0.8	2.1	4.2	9.8	9.5	7.2	3.8	0.8	0.8	2.1	6.7	12.8	9.6	10.8	10.7
46005	46.1N	131.0W	0.2	0.3			0.2	0.9	1.1	1.3		0.6	1.3	1.2	4.2	10.5	5.6	3.4				0.9	9.2	14.6	26.9	11.6
46006	40.7N	137.7W	0.1				0.3		0.5	0.5	2.6			<.05	4.4	4.9	4.5	5.6	3.5	<.05		0.1	12.7	12.5	21.7	15.0
46010	46.2N	124.2W	1.5	0.3	0.5	1.2	0.9	0.4	1.5	2.1	11.3	1.5	3.4	2.0	2.8	3.8	11.3	17.8	1.7				7.0	10.7	9.3	8.5
46011	34.9N	120.9W	2.2	0.4	0.1	0.4	0.8	0.6	1.4	1.2	3.6	0.2		0.9	1.1	1.0	2.0	13.3	6.9						0.4	55.7
46012	37.4N	122.7W				1.2	3.6	5.5	0.6	2.0	0.2			1.6	4.6	0.7	15.0	21.3				0.3	1.0		3.0	29.2
46013	38.2N	123.3W	0.3	0.2	0.3	0.6	0.5	1.1	1.3	1.2	0.1			<.05	0.9	0.5	1.8	7.7							14.9	41.9
46014	39.2N	124.0W	0.4							0.1	3.7	0.5					0.5	5.1	5.4							65.5
46016	63.3N	170.3W	0.7	2.6	1.7			0.1	1.5	1.0	2.8	10.0	4.2	0.1	0.7	3.8	17.7	8.6	0.3	17.9	2.3	1.1	0.3	2.4	11.8	0.7
46017	60.3N	172.3W	0.4	2.6	1.9	0.1		0.8	1.0	0.6	2.4	28.7	7.0	3.1	1.4	13.8	6.4		0.3	20.5	3.9	1.3		1.9	1.9	
46019	57.2N	170.3W	5.0	2.6	1.9	0.9	0.6	1.1		0.9	7.2	14.6	25.6	5.1	2.1	1.4	3.4	2.3	6.0	8.2	5.4	5.7				
46020	55.9N	168.0W									42.4	10.9	12.0	4.3				21.7	8.7							
46022	40.8N	124.5W	0.8	0.6	0.6	0.7	0.7	0.7	1.0	0.8	16.7	1.5	0.1	0.6	0.9	1.4	1.1	14.0	42.9	0.8	0.3		0.1	<.05		8.8
46023	34.3N	120.7W	0.1	0.1			0.2	0.7	1.6	1.0	1.9	0.8	0.1	0.3	0.1	0.5	2.7	7.9	16.1							50.7
46024	32.8N	119.2W	0.5	0.6	0.3	0.4	0.8	0.8	3.4	2.5	1.0	0.1				0.5	12.0	25.3							2.1	44.4
46025	33.6N	119.0W	0.9	1.5	2.2	3.7	4.0	0.9	0.5	2.7	0.9	0.3	1.8	4.6	3.8	7.4	32.4	8.7						<.05	5.7	2.0
46026	37.8N	122.7W	0.1	<.05	0.2	1.0	1.3	1.8	2.4	0.5	0.3			0.6	4.0	4.7	8.7	9.6							13.4	50.3
51001	23.4N	162.3W		0.1								6.0	12.4	0.1						34.2	47.0	0.1				
CSBF1	29.7N	085.4W	3.1	0.8	2.3	2.9	3.2	2.4	2.1	3.6	2.3	0.1	11.4	10.1	15.3	8.0	6.3	1.1		<.05	0.5	0.1	4.6	2.5	1.2	0.1
DBLN6	42.6N	079.5W	3.5	3.0	3.5	4.8	4.1	5.4	3.4	1.2	5.4	6.1	1.6	8.0	13.3	15.8	3.2	1.1	1.4	5.9	0.2	0.2		8.2	0.3	0.4

JUNE 1983			% FREQUENCY OF WIND SPEEDS (22- 33 KTS)								% FREQUENCY OF WIND SPEEDS (34-47 KTS)								% FREQUENCY OF WIND SPEEDS (>47 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.2	0.4	0.3		5.2	1.4		0.1																
41002	32.3N	075.3W																								
41006	29.3N	077.3W																								
42001	25.9N	089.7W				0.2	1.1	<.05	0.1																	
42002	26.0N	093.5W	0.4																							
42003	26.0N	085.9W				0.1																				
42007	30.1N	088.9W							0.1	<.05																
42008	28.7N	095.3W	0.5	0.2						0.1																
42009	29.3N	087.5W																								
42011	29.6N	093.5W	0.2																							
44003	40.8N	068.5W					0.1	<.05																		
44004	38.5N	070.7W	0.1	0.2				1.3	0.1	0.1																
44005	42.7N	068.3W																								
44007	43.5N	070.1W																								
45001	48.0N	087.6W																								
45003	45.3N	082.8W																								
45004	47.2N	086.5W																								
45005	41.7N	082.5W																								
45006	47.3N	090.0W																								
45007	42.7N	087.1W																								
45008	44.3N	082.4W																								
45009	41.6N	082.0W		1.9																						
46001	56.3N	148.3W																								
46002	42.5N	130.3W						0.6	0.1																	
46003	51.9N	155.7W	0.1	6.9	1.2	2.3		0.5	0.1																	
46004	50.9N	135.9W					2.1	<.05	0.1	0.1																
46005	46.1N	131.0W					1.4	0.4	1.8	2.3																
46006	40.7N	137.7W					1.3	3.2	5.7	0.8																
46010	46.2N	124.2W					0.5																			
46011	34.9N	120.9W								7.7																
46012	37.4N	122.7W								1.3																
46013	38.2N	123.3W							1.5	25.2																
46014	39.2N	124.0W	0.2							18.7																
46016	63.3N	170.3W		7.6																						
46017	60.3N	172.3W																								
46019	57.2N	170.3W																								
46020	55.9N	168.0W																								
46022	40.8N	124.5W	3.6							1.2																
46023	34.3N	120.7W	2.7							12.2																
46024	32.8N	119.2W								5.3																
46025	33.6N	119.0W																								
46026	37.8N	122.7W								0.9																
51001	23.4N	162.3W			0.1																					
CSBF1	29.7N	085.4W																								
DBLN6	42.6N	079.5W		0.3				0.6																		

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ADDRESSES OF NATIONAL WEATHER SERVICE PORT METEOROLOGICAL OFFICES

NOAA National Weather Service Port Meteorological Offices have personnel who visit ships in port to check and calibrate barometers and other meteorological instruments. In addition, port meteorologists assist masters and mates with problems regarding weather observations, preparation of weather maps, and forecasts. Meteorological manuals, forms, and some instruments are also provided.

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Inside Back Cover: Glomar Challenger in typhoon Bess.

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